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American Association of Economic Entomologists

(Organized in 1889)

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LIST OF MEETINGS AND PAST OFFICERS

First Annual Meeting, Washington, D. C., Nov. 12-14, 1889. President, C. V. Riley; First Vice-President, S. A. Forbes; Second Vice-President, A. J. Cook; Secretary, John B. Smith.

Second Annual Meeting, Champaign, Ill., Nov. 11-13, 1890. (The same officers had charge of this meeting.)

Third Annual Meeting, Washington, D. C., Aug. 17-18, 1891. President, James Fletcher; First Vice-President, F. H. Snow; Second Vice-President, Herbert Osborn; Secretary, L. O. Howard.

Fourth Annual Meeting, Rochester, N. Y., Aug. 15-16, 1892. President, J. A. Lintner; First Vice-President, S. A. Forbes; Second Vice-President, J. H. Comstock; Secretary, F. M. Webster.

Fifth Annual Meeting, Madison, Wis., Aug. 14-16, 1893. President, S. A. Forbes; First Vice-President, C. J. S. Bethune; Second Vice-President, John B. Smith; Secretary, H. Garman.

Sixth Annual Meeting, Brooklyn, N. Y., Aug. 14-15, 1894. President, L. O. Howard; First Vice-President, John B. Smith; Second Vice-President, F. L. Harvey; Secretary, C. P. Gillette.

Seventh Annual Meeting, Springfield, Mass., Aug. 27–28, 1895. President, John B. Smith; First Vice-President, C. H. Fernald; Secretary, C. L. Marlatt.

Eighth Annual Meeting, Buffalo, N. Y., Aug. 21–22, 1896. President, C. H. Fernald; First Vice-President, F. M. Webster; Second Vice-President, Herbert Osborn; Secretary, C. L. Marlatt.

Ninth Annual Meeting, Detroit, Mich., Aug. 12–13, 1897. President, F. M. Webster; First Vice-President, Herbert Osborn; Second Vice-President, Lawrence Bruner; Secretary, C. L. Marlatt.

Tenth Annual Meeting, Boston, Mass., Aug. 19–20, 1898. President, Herbert Osborn; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, C. L. Marlatt.

Eleventh Annual Meeting, Columbus, Ohio, Aug. 18–19, 1899. President, C. L. Marlatt; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, A. H. Kirkland.

Twelfth Annual Meeting, New York, N. Y., June 22–23, 1900. President, Lawrence Bruner; First Vice-President, C. P. Gillette; Second Vice-President, E. H. Forbush; Secretary, A. H. Kirkland.

Thirteenth Annual Meeting, Denver, Col., Aug. 23–24, 1901. President, C. P. Gillette; First Vice-President, A. D. Hopkins; Second Vice-President, E. P. Felt; Secretary, A. L. Quaintance.

Fourteenth Annual Meeting, Pittsburg, Pa., June 27–28, 1902. President, A. D. Hopkins; First Vice-President, E. P. Felt; Second Vice-President, T. D. A. Cockerell; Secretary, A. L. Quaintance.

Fifteenth Annual Meeting, Washington, D. C., Dec. 26–27, 1902. President, E. P. Felt; First Vice-President, W. H. Ashmead; Second Vice-President, Lawrence Bruner; Secretary, A. L. Quaintance.

Sixteenth Annual Meeting, St. Louis, Mo., Dec. 29–31, 1903. President, M. V. Slingerland; First Vice-President, C. M. Weed; Second Vice-President, Henry Skinner; Secretary, A. F. Burgess.

Seventeenth Annual Meeting, Philadelphia, Pa., Dec. 29–30, 1904. President, A. L. Quaintance; First Vice-President, A. F. Burgess; Second Vice-President, Mary E. Murtfeldt; Secretary, H. E. Summers.

Eighteenth Annual Meeting, New Orleans, La., Jan. 1–4, 1906. President, H. Garman; First Vice-President, E. D. Sanderson; Second Vice-President, F. L. Washburn; Secretary, H. E. Summers.

Nineteenth Annual Meeting, New York, N. Y., Dec. 28–29, 1906. President, A. H. Kirkland; First Vice-President, W. E. Britton; Second Vice-President, H. A. Morgan; Secretary, A. F. Burgess.

Twentieth Annual Meeting, Chicago, Ill., Dec. 27–28, 1907. President, H. A. Morgan; First Vice-President, H. E. Summers; Second Vice-President, W. D. Hunter; Secretary, A. F. Burgess.

Twenty-first Annual Meeting, Baltimore, Md., Dec. 28–29, 1908. President, S. A. Forbes; First Vice-President, W. E. Britton; Second Vice-President, E. D. Ball; Secretary, A. F. Burgess.

Twenty-second Annual Meeting, Boston, Mass., Dec. 28–29, 1909. President, W. E. Britton; First Vice-President, E. D. Ball; Second Vice-President, H. E. Summers; Secretary, A. F. Burgess.

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Plate 1 (Frontispiece)

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Boston, Mass., Dec. 29, 1909

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22 J. J. Davis
23 T. J. Headlee
24 G. H. Hollister
25 A. I. Bourne
26 H. P. Wood
27 C. W. Hooker
28 R. W. Braucher
29 B. H. Walden
30 H. J. Speaker
31 C. R. Crosby
32 F. H. Mosher
33 L. M. Pearis
34 A. H. Rosenfeld
35 G. W. Herrick
36 M. H. Swenk
37 H. S. Smith
38 J. N. Summers
39 Robert Parker
40 F. L. Washburn
41 C. T. Brues
42 W. C. O'Kane
43 W. M. Wheeler
44 H. L. Price
45 John Barlow
46 R. A. Vickery
47 P. F. Williams
48 F. B. Lowe
49 W. S. Abbot
50 Franklin Sherman, Jr.
51 J. L. Randall
52 R. I. Smith
53 H. E. Hodgkiss
54 O. A. Johannsen
55 A. F. Conradi
56 G. G. Ainslie
57 W. A. Thomas
58 R. L. Webster
59 W. E. Rumsey
60 L. Caesar

EXPLANATION OF PLATE I (FRONTISPIECE)

1 E. P. Felt
2 Herbert Osborn
3 C. P. Gillette
4 C. Gordon Hewitt
5 W. E. Britton
6 A. F. Burgess
7 H. E. Summers
8 J. B. Smith
9 J. L. Phillips
10 R. A. Cooley
11 A. F. Satterthwait
12 Edith M. Patch
13 T. B. Symons
14 P. J. Parrott
15 S. J. Hunter
16 H. A. Surface
17 E. D. Sanderson
18 N. E. Shaw
19 E. C. Cotton
20 F. L. Frost
21 A. G. Hammar
22 J. J. Davis
23 T. J. Headlee
24 G. H. Hollister
25 A. I. Bourne
26 H. P. Wood
27 C. W. Hooker
28 H. W. Braucher
29 B. H. Walden
30 H. J. Speaker
31 C. R. Crosby
32 F. H. Mosher
33 L. M. Peairs
34 A. H. Rosenfeld
35 G. W. Herrick
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OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

VOL. 3 FEBRUARY, 1910 No. 1

Proceedings of the Twenty-Second Annual Meeting of the American Association of Economic Entomologists

The twenty-second annual meeting of the American Association of Economic Entomologists was held at Harvard Medical School, Brookline, a suburb of Boston, Mass., December 28–29, 1909.

The business proceedings follow in Part I, while the addresses, papers and discussions will be found in Part II.

PART I

The meeting was called to order by President W. E. Britton at ten o'clock a. m., Tuesday, December 28th.

The attendance averaged one hundred members and visitors. The following members were present:

George G. Ainslee, Clemson College, S. C.; Arthur I. Bourne, Washington, D. C.; R. W. Braucher, Washington, D. C.; W. E. Britton, New Haven, Conn.; C. T. Brues, Forest Hills, Mass.; A. F. Burgess, Washington, D. C.; Lawson Caesar, Guelph, Canada; C. W. Collins, Melrose Highlands, Mass.; A. F. Conradi, Clemson College, S. C.; Mel. T. Cook, Newark, Del.; R. A. Cooley, Bozeman, Mont.; E. C. Cotton, Knoxville, Tenn.; C. R. Crosby, Ithaca, N. Y.; R. A. Cushman, Washington, D. C.; J. J. Davis, Urbana, Ill.; E. B. Engle, Harrisburg, Pa.; E. R. Farrer, South Lincoln, Mass.; E. P. Felt, Albany, N. Y.; W. F. Fiske, Melrose Highlands, Mass.; S. A. Forbes, Urbana, Ill.; H. L. Frost, Arlington, Mass.; B. N. Gates, Washington, D. C.; H. Garman, Lexington, Ky.; C. P. Gillette, Fort Collins, Colo.; A. G. Hammar, Washington, D. C.; T. J. Headlee, Manhattan, Kan.; G. W. Herrick, Ithaca, N. Y.; C. Gordon Hewitt, Ottawa, Canada; W. E. Hinds, Auburn, Ala.; E. F. Hitchings, Augusta, Me.; H. E. Hodgkiss, Geneva, N. Y.; W. J. Holland, Pittsburg, Pa.;

G. H. Hollister, Hartford, Conn.; C. W. Hooker, Washington, D. C.; L. O. Howard, Washington, D. C.; S. J. Hunter, Lawrence, Kan.; O. A. Johannsen, Orono, Me.; F. A. Johnston, Amherst, Mass.; Nathaniel T. Kidder, Milton, Mass.; F. W. Lowe, Detroit, Mich.; A. D. McGillivray, Ithaca, N. Y.; J. H. Merrill, Danvers, Mass.; F. H. Mosher, Melrose Highlands, Mass.; A. P. Morse, Wellesley, Mass.; W. C. O'Kane, Durham, N. H.; Herbert Osborn, Columbus, Ohio; J. R. Parker, Amherst, Mass.; P. J. Parrott, Geneva, N. Y.; Edith M. Patch, Orono, Me.; L. M. Peairs, College Park, Md.; E. E. Philbrook, Portland, Me.; J. L. Phillips, Blacksburg, Va.; Asa O. Pike, Springvale, Me.; W. J. Price, Blacksburg, Va.; J. L. Randall, Pittsburg, Pa.; F. W. Rane, Boston, Mass.; W. A. Riley, Ithaca, N. Y.; E. P. Ripley, Weston, Mass.; D. M. Rogers, Boston, Mass.; A. H. Rosenfeld, Baton Rouge, La.; W. E. Rumsey, Morgantown, W. Va.; E. D. Sanderson, Durham, N. H.; A. F. Satterthwait, Harrisburg, Pa.; Wm. Saunders, Ottawa, Canada; N. E. Shaw, Columbus, Ohio; Franklin Sherman, Jr., Raleigh, N. C.; Henry Skinner, Philadelphia, Pa.; Harry S. Smith, Melrose Highlands, Mass.; J. B. Smith, New Brunswick, N. J.; R. I. Smith, West Raleigh, N. C.; A. M. G. Soule, York Village, Me.; A. L. Stene, Kingston, R. I.; H. E. Summers, Ames, Iowa; J. N. Summers, Amherst, Mass.; H. A. Surface, Harrisburg, Pa.; Myron H. Swenk, Lincoln, Neb.; T. B. Symons, College Park, Md.; W. R. Thompson, Melrose Highlands, Mass.; P. H. Timberlake, Melrose Highlands, Mass.; R. A. Vickery, Washington, D. C.; B. H. Walden, New Haven, Conn.; F. L. Washburn, St. Anthony Park, Minn.; R. L. Webster, Ames, Iowa; W. M. Wheeler, Boston, Mass.; R. D. Whitmarsh, Amherst, Mass.; E. L. Worsham, Atlanta, Ga., and L. H. Worthley, Boston, Mass.

Among the visitors present, the following were noted:

Frank A. Bates, South Braintree, Mass.; M. B. Cummings, Burlington, Vt.; G. R. Cushman, Baltimore, Md.; W. P. Headden, Fort Collins, Colo.; P. L. Huested, Blauvelt, N. Y.; F. N. Fagan, Columbus, Ohio; W. H. Gates, Baton Rouge, La.; C. F. Jackson, Durham, N. H.; W. S. Regan, Amherst, Mass.; H. J. Speaker, Port Clinton, Ohio; Dr. C. W. Stiles, Washington, D. C.; L. R. Taft, East Lansing, Mich.; P. F. Williams, Auburn, Ala., and R. Wooldridge, Melrose Highlands, Mass. A number of ladies were also present at each session.

The report of the Secretary was read as follows:

REPORT OF THE SECRETARY

At the time of the last annual meeting the roll of the Association included 252 members. The membership was then increased by the election of one active, 38 associate and two foreign members and 16 associate members were transferred to the active roll. During the year one member in each class has been called by death, namely, Prof. Mark Vernon Slingerland, B. H. Guilbeau and Dr. A. Giard. The present roll contains the names of 118 active, 124 associate and 46 foreign members, so that the year has shown an increase in each class of membership and a net gain including all classes of 36.

Nearly twenty applications for membership have already been received by the Secretary and referred to the Committee on Membership, which forecasts a substantial gain in membership before this meeting shall have closed.

The Secretary has revised and circulated the list of common names of insects adopted by the Association, as directed at the last meeting, and together with the increasing correspondence and the work required on the JOURNAL has not lacked employment for such spare time as could be devoted to the work. The records of the dues paid by members has been transferred to a card catalogue so that the information can be more readily available.

By vote of the Executive Committee the Secretary was authorized to expend for clerical assistance such amount as was deemed necessary, the total not to exceed one half of the unexpended balance of the previous year; $15.50 has been used for this purpose.

The Association is in a good financial condition, as will be seen in the following statement:

FINANCIAL STATEMENT.

Balance on hand, December 28, 1908			$91.57
By amount received for dues, 1909			164.00
To stenographic report 1908 meeting	$32.45		
stamps and stamped envelopes	38.91		
printing	38.50		
card catalogue case and cards	6.35		
clerical work, secretary's office	15.50		
supplies	1.80		
telegraph and express charges	.87		
		$134.88	
Balance in treasury		121.19	
		$255.57	$255.57

Respectfully submitted,

A. F. BURGESS, *Secretary.*

By vote of the Association, the report was accepted and referred to the Auditing Committee, for special report later in the session.

The report of the Committee on Nomenclature was presented by Mr. Herbert Osborn, and, after a general discussion and various changes which were made in the insect names recommended for common use, it was adopted in the following form:

REPORT OF THE COMMITTEE ON NOMENCLATURE

The committee recommends: First, That the use of a common name for both larval and adult forms of an insect be permissible in cases where a common name for each form is already in general use and is properly distinctive; the policy for adoption of such names by this Association to be the same as for adoption of any single name, that is, each name to be considered on its merits;

Second, That use of different names for a given insect for geographic regions be discouraged, and officially indorsed only when the circumstances clearly require such usage in order to meet the conditions existing in such region. In the majority of such cases it is believed that it will be better policy to omit or postpone the official adoption by the Association of any name of this class and permit the problem to solve itself if possible by common usage of the names in question.

It is recommended that the list of names adopted at this meeting be included as heretofore in the Proceedings of the Association. A plan of publishing the list in uniform style, as additions are made from year to year, is suggested for consideration. This list, to properly serve its purpose, should be kept up to date and should be readily accessible to all writers on economic entomology.

The committee desires to thank the members who have shown an interest in the matter of common names for insects and expresses the desire that this interest will continue.

Respectfully submitted,

HERBERT OSBORN,
A. L. QUAINTANCE,
Committee.

LIST OF COMMON NAMES ADOPTED DECEMBER 28TH, 1909

Pomace fly	*Drosophila ampelophila* Loew.
Asparagus miner	*Agromyza simplex* Loew.
Beet leaf-hopper	*Eutettix tenella* Baker.
Coffee-bean weevil	*Araecerus fasiculatus* DeGeer.
Sugar cane borer	*Diatræa saccharalis* Fab.
Cotton aphis (or Melon aphis)	*Aphis gossypii* Glover.
Cranberry spanworm	*Cleora pampinaria* Guen.
Citrus mealy bug	*Pseudococcus citri* Risso.
Diamond-back moth	*Plutella maculipennis* Curtis.
Elm span worm	*Ennomos subsignaria* Hbn.
False potato beetle	*Leptinotarsa juncta* Germ.
Grape colaspis	*Colaspis brunnea* Fab.
Green fruit worm	*Xylina antennata* Walker.
Greenhouse thrips	*Heliothrips hæmorrhoidalis* Bouché.
Hag moth	*Phobetron pithecium* S. and A.
Hop flea-beetle	*Psylliodes punctulata* Melsh.
Tobacco worm	*Phlegethontius quinque-maculatus* Haw.
Orange thrips	*Euthrips citri* Moulton.
Green peach aphis	*Myzus persicæ* Sulz.
Black peach aphis	*Myzus persicæ-niger* Smith.
Periodical cicada	*Tibicen septendecim* L.
Rocky mountain locust	*Melanoplus spretus* Uhl.
Flower thrips	*Euthrips tritici* Fitch.
Shot hole borer	*Scolytus rugulosus* Ratz.
Southern pine sawyer	*Monohammus titillator* Fab.
Striped garden caterpillar	*Mamestra legitima* Grote.
White marked tussock moth	***Hemerocampa leucostigma*** S. and A.
Water-cress leaf beetle	*Phædon æruginosa* Suffr.
Water-cress sowbug	*Mancasellus brachyurus* Harger.
Western pine beetle	*Dendroctonus brevicomis* Lec.
Southwestern pine beetle	*Dendroctonus barberi* Hopk.
Roundheaded pine beetle	*Dendroctonus convexifrons* Hopk.
Southern pine beetle	*Dendroctonus frontalis* Zimm.
Arizona pine beetle	*Dendroctonus arizonicus* Hopk.
Smaller mexican pine beetle	*Dendroctonus mexicanus* Hopk.

Larger mexican pine beetle	*Dendroctonus parallelocollis* Chap.
Colorado pine beetle	*Dendroctonus approximatus* Dietz.
Mountain pine beetle	*Dendroctonus monticolæ* Hopk.
Black Hills beetle	*Dendroctonus ponderosæ* Hopk.
Jeffrey pine beetle	*Dendroctonus jeffreyi* Hopk.
Eastern larch beetle	*Dendroctonus simplex* Lec.
Douglas fir beetle	*Dendroctonus pseudotsugæ* Hopk.
Eastern spruce beetle	*Dendroctonus piceaperda* Hopk.
Engelmann spruce beetle	*Dendroctonus engelmanni* Hopk.
Alaska spruce beetle	*Dendroctonus boreulis* Hopk.
Sitka spruce beetle	*Dendroctonus obesus* Mann.
Redwinged pine beetle	*Dendroctonus rufipennis* Kirby.
Lodgepole pine beetle	*Dendroctonus murrayanæ* Hopk.
Allegheny spruce beetle	*Dendroctonus punctatus* Lec.
European spruce beetle	*Dendroctonus micans* Kug.
Black turpentine beetle	*Dendroctonus terebrans* Oliv.
Red turpentine beetle	*Dendroctonus valens* Lec.

The report of the Committee on Testing Proprietary Insecticides was presented by Mr. E. D. Sanderson.

Mr. Sanderson stated that the main work that had been done by the committee had been an effort to secure a national insecticide law and that the progress in that direction had been reported in the last issue of the JOURNAL OF ECONOMIC ENTOMOLOGY. The prospects of the passage of such a law are very good and the matter will be taken up at the present session of Congress. He requested the support of the members in furthering this legislation.

Voted that the report be accepted and the committee continued.

Mr. Myron H. Swenk reported for Mr. Laurence Bruner, chairman of the Committee on Affiliation, that some progress had been made in this work, but that no further report could be submitted at this time.

By vote of the Association, the report was accepted as a report of progress, and the committee continued.

The President introduced Dr. C. W. Stiles of the United States Marine Hospital Service, who stated that he wished to call the attention of the Association to a movement which was being made to secure greater permanency for insect nomenclature. He stated that the matter was to be considered at the next meeting of the International Zoölogical Congress, next summer, and for the purpose of securing a list of accepted binominal names to submit to that meeting, he requested that as many zoölogists as possible forward to him a list of names which they considered authentic. These names are desired within the next three months, so that they can be edited, and from them a list will be selected for submittal to the meeting next summer.

The idea of this movement is to secure more stability in the nomen-

clature, and no one is expected to change the names accepted by the congress, without its approval.

Botanical as well as zoölogical names are desired.

It was suggested that a committee be appointed to take charge of this matter, and by vote of the Association it was referred to the Executive Committee.

The President appointed the following committees:

Nominations—S. A. Forbes, E. P. Felt and W. E. Hinds.

Resolutions—Franklin Sherman, Jr., C. P. Gillette and E. D. Sanderson.

Auditing—T. J. Headlee and E. L. Worsham.

Owing to the absence at the meeting of Mr. H. T. Fernald and Mr. W. D. Hunter, members of the Committee on Membership, the chair appointed Mr. H. E. Summers and the Secretary to fill the vacancies on the committee.

By a vote of the Association, the President was authorized to appoint a committee of three members to draft suitable memorial resolutions for the members who had died during the year, and Messrs. Herbert Osborn, C. R. Crosby and F. L. Washburn were appointed.

The Secretary read an invitation from Dr. Ludwig Von Graff, President of the Eighth International Zoölogical Congress, requesting that delegates be appointed to attend the meeting, which will be held at Gratz, Austria, from August 15th to 20th, 1910.

By vote of the Association, the matter was referred to the Executive Committee, with power to act.

A letter was read by the Secretary from Prof. H. A. Gossard, of Wooster, Ohio, expressing his regrets that he was not able to be present at the meeting, and bring with him the Ohio Exhibit of Insects, used for exhibition at state and county fairs. Owing to illness and other unexpected difficulties it was not possible to send the exhibit, but Professor Gossard promised to prepare a fully illustrated paper for the JOURNAL.

At four o'clock p. m., Wednesday, December 29th, the papers of the program having been disposed of, the final business of the session was transacted.

Mr. Sanderson suggested that some action be taken whereby at the next meeting members of the Association might be provided with a distinctive button, so that they could be readily distinguished from members of other affiliated societies present at the convention.

On motion, it was voted that the matter be referred to the Executive Committee, for its consideration, with power to act.

The report of the Auditing Committee was presented by Mr. T. J. Headlee, as follows:

REPORT OF THE AUDITING COMMITTEE

Your Auditing Committee for the 22nd annual meeting begs to report that it has carefully examined the accounts of your secretary, and found them in most satisfactory condition.

Respectfully submitted,

T. J. HEADLEE,
E. L. WORSHAM,
Committee.

By vote of the Association, the report was accepted.

President Britton stated that on account of a recent ruling made in the United States Department of Agriculture, it was not possible for members of the Association to secure their expenses when attending the annual meeting of this Association, and he suggested that some action should be taken to provide for the expenses of the Secretary at the meeting, and then presented the report of the Executive Committee, which is as follows:

REPORT OF EXECUTIVE COMMITTEE

In June this Association was invited by Sir William Ramsay to send a delegate to the International Congress of Applied Chemistry to be held in London, May 22d to June 2d, 1909. As it seemed desirable to have the Association represented and as we are not yet able financially to send a delegate so far and pay his expenses, your president asked Doctor Howard, who had planned a trip abroad, if he could not attend this meeting as a delegate. Finding this impracticable, one of our foreign members, Prof. A. E. Shipley of Cambridge, England, was asked to do so, and kindly represented the Association.

About the first of October the President was asked to appoint a delegate to represent the Association at the dedication of the new building of the College of Physicians at Philadelphia, November 10th. Dr. Henry Skinner was appointed, and kindly consented to be present.

On December 13th the President learned from Mr. W. L. W. Field of the plans to unveil during Convocation Week a tablet upon the site, in Milton, where Dr. T. W. Harris formerly lived. Mr. Field asked if he could be authorized to state that this Association would be represented at the unveiling. The authorization was gladly given, and Professor W. M. Wheeler was appointed to be present on that occasion as a representative of the Association.

The Executive Committee authorized the Secretary to expend money for the clerical work of the office to an amount not exceeding one half the unexpended balance of the previous year. This balance was $91.45. So far $15.50 has been used for this purpose. The committee further recommends

that for the coming year the Executive Committee be authorized to pay the Secretary such amount as it sees fit as a small honorarium.

Respectfully submitted,

W. E. BRITTON, *President.*
H. E. SUMMERS, *Second Vice-President.*

By vote of the Association, the report was accepted and its recommendations adopted.

The report of the Committee on Resolutions was presented by Franklin Sherman, Jr., as follows:

REPORT OF COMMITTEE ON RESOLUTIONS

The committee on resolutions submits the following:

Resolved, That the American Association of Economic Entomologists hereby expresses its appreciation of the courtesies extended by the local committee on arrangements, the Cambridge Entomological Club, and the Corporation of Harvard University.

Resolved, That the thanks of the Association be tendered to the editorial management of the JOURNAL OF ECONOMIC ENTOMOLOGY for the excellent standard which they have maintained for the official organ of this Association.

Resolved, That we again declare our conviction that the control of the Gypsy Moth and the Brown-tail Moth in New England is an economic problem of the first magnitude, and of the most vital importance to the entire country. Furthermore, we would emphasize the importance of the several New England States and the United States Department of Agriculture continuing with undiminished vigor the policies so ably prosecuted during the past few years.

Resolved, That this Association urges upon Congress the necessity of legislation to provide for inspection to prevent the introduction of dangerous insects and plant diseases, and we recommend that this Association appoint as a committee Messrs. Symons, Worsham and Atwood to represent it in furthering such legislation.

Resolved, That we again endorse the bill now before Congress for the control of the purity of insecticides and fungicides (H. R. 2218).

Respectfully submitted,

FRANKLIN SHERMAN, JR.,
E. D. SANDERSON,
C. P. GILLETTE,
Committee.

Voted that the report be accepted and its recommendations adopted.

The report of the Committee on Memorial Resolutions was presented by Mr. Herbert Osborn, as follows:

REPORT OF COMMITTEE ON MEMORIAL RESOLUTIONS

Your committee to prepare resolutions relative to the members of the society who had died during the past year, beg leave to report as follows:

Prof. M. V. SLINGERLAND, President of this Association in 1903, who died March 10th, 1909, had won for himself an enviable place among American Entomologists by the accuracy and originality of his observations and by the clearness and directness of his writings. As an Economic Entomologist, while insisting on absolute scientific accuracy, he never lost sight of the necessity of presenting the results of his studies in a form available for the public. He was an inspiring and sympathetic teacher and numbered as his friends all who had association with him. His untimely death is a distinct loss to Entomological Science.

By the death of Prof. B. H. GUILBEAU, the Society has lost one of its younger members who had already proved his ability as an investigator and teacher. His worth was generally recognized, and those of us who had the privilege of meeting him on the occasions when he attended our sessions were impressed with his qualities of earnestness, sincerity and friendliness.

In the death of Prof. A. GIARD, we recognize the loss of one of our most distinguished foreign members. His contributions to Economic Entomology have for many years been recognized as of special merit, and the Society feels that Entomological Science is deprived of an able exponent.

Resolved, That these resolutions be placed in the published records of this meeting of the society, and that copies be transmitted to the families of these deceased members with an expression of our sincere sympathy in their personal loss.

Respectfully submitted,

HERBERT OSBORN,
F. L. WASHBURN,
C. R. CROSBY,
Committee.

By vote of the Association, the resolutions were adopted.

The report on the Committee of Membership was read by Mr. J. B. Smith, as follows:

REPORT OF THE COMMITTEE ON MEMBERSHIP

Dr. L. O. Howard has nominated as foreign members: Prof. Nikolai M. Kulagin, of the Landwirtschaftliches Institut in Petrooskoje, Moscow,

Russia; Prof. G. Severin, Curator of the Natural History Museum in Brussels, and Prof. S. I. Kuwana, of the Imperial Agricultural Experiment Station of Japan, Nishigahara, Tokio, Japan.

The committee recommends that these persons be elected as foreign members.

The committee recommends for advancement from associate membership to the list of active members: Mr. C. T. Brues, Mr. C. R. Crosby, Mr. J. J. Davis, Mr. H. J. Franklin, Mr. A. G. Hammar, Mr. E. F. Hitchings, Mr. Fred Johnson, Mr. A. D. MacGillivray, Mr. H. M. Russell, Mr. M. H. Swenk, Mr. O. H. Sweezey, Mr. J. L. Webb and Mr. W. W. Yothers.

Your committee recommends the transfer from the foreign membership list to the list of active members of Dr. C. Gordon Hewitt, of the Central Experiment Farms, Ottawa, Canada.

Dr. W. B. Alwood has presented his resignation as member of the Association to the Secretary, and your committee recommends its acceptance.

The following names are presented for associate membership:

Arthur I. Bourne, Bureau of Entomology, Washington, D. C.
Lawson Caesar, Guelph, Ontario, Canada.
S. C. Clapp, Department of Agriculture, Raleigh, N. C.
Wesley R. Coe, New Haven, Conn.
C. W. Collins, Gypsy Moth Parasite Laboratory, Melrose Highlands, Mass.
Samuel S. Crossman, Orlando, Fla.
Wm. E. Evans, Jr., Painesville, Ohio.
Edward R. Farrar, South Lincoln, Mass.
Warren S. Fisher, Highspire, Pa.
S. W. Foster, Bureau of Entomology, Washington, D. C.
C. B. Hardenberg, Bureau of Entomology, Washington, D. C.
R. W. Harned, Agricultural College of Mississippi.
William B. Herms, University of California, Berkeley, Cal.
P. H. Hertzog, Lewisburg, Pa.
G. H. Hollister, Hartford, Conn
O. A. Johannsen, Orono, Maine.
F. A. Johnston, Amherst, Mass.
Nathaniel T. Kidder, Milton, Mass.
Joseph H. Merrill, Danvers, Mass.
Z. P. Metcalf, Raleigh, N. C.
Albert P. Morse, Wellesley, Mass.
W. C. O'Kane, Durham, N. H.
John R. Parker, Amherst, Mass.
E. E. Philbrook, Portland, Maine.
Asa O. Pike, Springvale, Maine.
Edw. P. Ripley, Weston, Mass.
T. E. Snyder, Bureau of Entomology, Washington, D. C.
A. M. G. Soule, York Village, Maine.
John N. Summers, Amherst, Mass.
William R. Thompson, Melrose Highlands, Mass.
Philip H. Timberlake, Melrose Highlands, Mass.
William R. Walton, Harrisburg, Pa.
R. D. Whitmarsh, Amherst, Mass.

V. L. Wildermuth, Bureau of Entomology, Washington, D. C.
L. H. Worthley, Boston, Mass.
James F. Zimmer, Bureau of Entomology, Washington, D. C.

Nine active members are in arrears for dues for three years, and the committee recommends that the Secretary notify these members of their delinquency. If within three months they have not paid the full amount due, the Secretary is instructed to strike their names from the list of members.

Ten associate members are in arrears for dues, three years, and the committee recommends the same action.

Respectfully submitted,
JOHN B. SMITH,
H. E. SUMMERS,
A. F. BURGESS,
Committee.

By vote of the Association, the report was accepted and its recommendations adopted.

The report of the Nominating Committee was read by Mr. E. P. Felt, as follows:

REPORT OF THE NOMINATING COMMITTEE

The committee submit the following nominations:

President, E. D. Sanderson, Durham, N. H.
First Vice-President, H. T. Fernald, Amherst, Mass.
Second Vice-President, P. J. Parrott, Geneva, N. Y.
Member of Committee on Nomenclature, H. Garman.
Members of the Advisory Board of the JOURNAL OF ECONOMIC ENTOMOLOGY, C. P. Gillette, Fort Collins, Colo., and Wilmon Newell, Baton Rouge, La.
Councillors for the American Association for the Advancement of Science S. A. Forbes and H. E. Summers.

Respectfully submitted,
S. A. FORBES,
E. P. FELT,
W. E. HINDS,
Committee.

By vote of the Association, the Secretary was instructed to cast a ballot in favor of the members named in the report as officers for the ensuing year.

It was also voted that the time and place for holding the next meeting be referred to the Executive Committee, with power to act.

The Secretary announced that on the following morning an excursion would be made to Arlington to witness a spraying demonstration at the office of Messrs. H. L. Frost & Co.[1]

There being no further business, the meeting adjourned.

[1] Thursday morning, December 30th, 1909.—About 25 members were pres-

PART II

The address of President W. E. Britton was presented at the opening session Tuesday morning, with Second Vice-President Summers in the chair, and was as follows:

THE OFFICIAL ENTOMOLOGIST AND THE FARMER

By W. E. Britton, *New Haven, Conn.*

It is with hesitating steps that I attempt to follow the path, at first but a trail, blazed by the pioneers of American Economic Entomology, and later trodden by their followers, so illustrious—some of whom are no longer with us. That path is now a well-worn thoroughfare. Seemingly little grain can be left along its borders, so many careful workers have gleaned by the wayside.

In looking over the list of subjects treated in the addresses of former presidents of this Association, I find that almost every phase of Economic Entomology has been ably discussed, but conditions are ever changing, and it remains for me to call your attention to a few present aspects of the subject, and to leave with you a few somewhat disconnected thoughts regarding them.

My subject, "The Official Entomologist and the Farmer," needs perhaps a word of explanation. By "official entomologist" I mean such men as are employed by the various states and territories and by the Federal Government to study insects and their relations to man and his crops. It includes state entomologists, state nursery inspectors, commissioners in charge of suppressing certain important pests, experiment station entomologists, professors of entomology in agricultural and other colleges, and members of the working staff of the Bureau of Entomology at Washington. Certain museum curators also might well be included under the term. It may be assumed at the out-

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ent at the demonstration, as guests of Mr. H. L. Frost, and after examining his office and extensive storehouse, containing all kinds of insecticide machinery, the demonstration was held. A high power gasolene sprayer was used, and the members had an opportunity to observe the solid stream system of spraying.

Several new devices, in the way of couplings, nozzles, etc., were also on exhibition.

All those present expressed much satisfaction in having had an opportunity to be present at the demonstration, and a vote of thanks was extended to Mr. Frost for his courtesy and hospitality.

set that the official entomologist is an economic entomologist, because men are not usually employed by nations, states, or even universities and colleges to investigate the purely scientific aspects of entomology. Such an official, therefore, is supposed to be in readiness to impart information at all times and places regarding insects and their injury, and how to suppress them.

For the purpose of this discussion we should not limit the term "farmer" to the man who tills the soil as his chief business, but should rather give it a broader interpretation and make it include the "gentleman farmer" and the resident of the village and city; in fact, anyone and everyone who can be helped by the official entomologist or who seeks his aid. In other words, the title might read, "The Official Entomologist and His Constituency."

What are the qualifications of a model official entomologist? For the first essentials we can probably do no better than to quote from Mr. F. M. Webster's excellent paper before this Association at the Baltimore meeting a year ago in regard to the requisites of an assistant.

"With all of us who have the management of men there comes a time when an emergency arises and someone must be detailed to a most difficult piece of investigation, where only the most resourceful, persevering and trustworthy are to be employed, and lucky is the man who gets the opportunity. Now if I were to be asked to indicate some of the most essential qualifications for such a man I should say, first, honesty, and, second, common sense."[1]

Let us adopt these qualifications as being the two most important ones also for the official entomologist. Indeed, lacking them he can never be a real success in this or any other profession. The importance of training should not be overlooked, and right here let me say that many, perhaps most, of us have gone into our work and our positions with very scanty training. In fact, the great demand for workers during the past few years has necessitated the acceptance of many otherwise excellent men who are not sufficiently trained in entomological methods and technique. This cannot be helped, and in such cases the men must get their training through actual experience in their work, which is perhaps after all the best school. If these men have honesty, common sense, energy and a little ingenuity, or resourcefulness, they will soon outstrip others who have had far better training in whom these qualities are lacking.

The entomologist must do something more than gather facts; he

[1] Journal of Economic Entomology, Vol. II, p. 99, April, 1909.

must be able to interpret their meaning. He cannot always be in his office or laboratory, even though it is a great convenience to his people to find him when they call. He cannot always be in the field, but he should have a thorough knowledge of the conditions there. In fact, he should have a good general knowledge of all phases of his subject, and it is desirable that he be a specialist and an authority in a few of them.

Probably few of us possess all qualifications necessary to make us ideal official entomologists. Perhaps everyone has some of them. As his work increases, he must have help,—and if funds are available, scientific and clerical assistants are secured. He must then plan and direct their efforts as well as his own. He must possess tact, must be a good organizer, and must be able to judge the ability and capacity for work in others. He must be able to manage men. New problems are then introduced in regard to the proper credit for work done by his assistants. The ideal official should err on the side of generosity rather than that of selfishness in such matters. It is true that the assistants can usually do much of the routine work where no credit is expected or given in publication.

In his relations with other entomologists he must be courteous, and give credit where credit is due. He should refrain from engaging in personal controversies, though he should not hesitate to stand up for the right as he sees it.

Too many of us have our attention occupied by work of a routine nature because of a lack of help. It is extremely important that the entomologist be given some time for research work in order that he may aid in increasing the sum total of human knowledge in his chosen subject. There are still many problems to be solved, and the official entomologist from his wealth of experience and observations can survey the field with a broader view than the beginner. Unfortunately, in many cases the official has little time for investigation and whatever is done must be done by assistants. At any rate, some research work should be done.

To gain knowledge through observation and research is clearly the first essential of the profession. The second essential is to bring this knowledge before the public. And let me say that right here is one of the problems of the official entomologist as well as of every experiment station worker. The most intelligent farmers, and a certain number of merchants, manufacturers and employees, as well as scientists, are always in touch with such work and often aid the official in it. But there is always a great mass of people who have never heard of the state entomologist or of the agricultural experiment station of

their own state, and who are entirely ignorant of all such matters. They must be informed. I say *must* because their own welfare and the public interests are at stake. The public health demands it. Health officers and medical men are now calling upon official entomologists for expert evidence and advice about the breeding places of mosquitoes and flies, and this support should be given them wherever possible. Ignorance of the law—man's law—excuses no one; but in ignorance of nature's laws our greatest dangers lie. The comparatively recent discoveries of the spread of human diseases by insects make it imperative that no opportunity be neglected to place the proper instruction regarding entomological sanitation before the people. This should be done, however, in a dignified way, and the commonest method is by means of publications. Lectures, illustrated by lantern slides and by insect specimens, are also an important means of getting the facts before the people. The press is our most powerful ally, but the modest entomologist shrinks from the publicity acquired if he is interviewed too often by the reporter, and also hesitates to send information to the papers. Perhaps some of this publicity can be avoided if the information is given out as coming from the institution instead of from any particular individual connected with it.

I believe that educational exhibits at fairs and agricultural meetings are of the greatest value in educating the people. They should be arranged in an attractive manner, and supplied with neat descriptive labels that give real information. In an exhibit of this kind at a Connecticut fair in September, twenty cages of living insects attracted more attention and excited more interest than any other portion of the exhibit. The living insects shown included mosquitoes, both *Anopheles* and *Culex*, in larval, pupal and adult stages, and a number of caterpillars, which could be readily procured at that time of the year, most of them being common pests of the field or garden.

We should avoid the vaudeville methods practiced by some zealous workers for the betterment of mankind. Dignity and good taste should be maintained, or we had better dispense altogether with this means of educating the public.

In order to do effective work, an official entomologist must have the confidence of his clientele. It is not always easy to gain this confidence. Personal contact with the farmer, honesty and frankness regarding entomological matters, and prompt attention to the details of each inquiry will help much. It is always better to say "I don't know," if that indeed be the truth, than to allow the farmer to learn that fact from some other source.

I have given some of the requirements of the ideal official entomologist. Few of us, I fear, can meet them. Nevertheless, in spite of all his shortcomings, the official entomologist is often of great practical value to the state. For instance, in case of a local outbreak of a serious insect, if there is an authorized entomologist with forces already organized and a small fund at his disposal, the pest may be not only kept from spreading, but perhaps actually exterminated in that locality, thus saving great losses of crops as well as tremendous expenditures of money to later subdue the pest and get it under control, if that is even possible.

The experience of the New England states with the gypsy moth, *Porthetria dispar* Linn., and the shipment into this country of nests of the brown-tail moth, *Euproctis chrysorrhœa* Fabr., on nursery stock last year, in the absence of any system of Federal inspection, would seem to make it not only expedient but almost necessary for the safety of property and other interests, that each state not having such a department should at once organize one. An instance from my own state will serve as an example: On December 14th, 1909, I learned that the gypsy moth had been reported from the town of Wallingford. That very day we verified the report, and the following day had men at work destroying the egg-masses, getting 2,000 the first day. Since then the work has been continued, and over 5,000 egg-masses have been destroyed. The infestation is a bad one, covering at least three quarters of a square mile, but the pest must be exterminated. It is needless to say that any prompt and effective suppressive measures would be out of the question in a state without funds available for the purpose and an organized entomological force ready to act.

There are still many farmers in each state who have never heard of their own agricultural experiment station or even of the Federal Department of Agriculture,—but their number is growing less and less—and these institutions are now more firmly entrenched in the minds and the work and lives of the people than ever before. The taxpayer may have borers in his squash vines, San José scale on his fruit trees, or lice on his cattle; he likes to have some central bureau of the state or Federal government where he can apply for information entomological and feel that he will receive the best of advice.

Having just mentioned some of the qualifications of the official entomologist and the proper development of his department for efficient service, it now behooves me to say a few words about the ideal farmer, or member of the entomologist's constituency. He is often a hard working man, with little time for study, and his interest has never been aroused in the living things around him. He is too often

bent on "making both ends meet." The most intelligent are usually ready and willing to aid the entomologist by furnishing information about the prevalence of certain insects, and report regularly to him. They take their teams at a busy season and drive him around the neighborhood in order that he may get a better idea of conditions prevailing there. Coöperative experiments are arranged and often carried out faithfully, to the advantage of both owner and experimenter.

Occasionally we have experiences similar to that of an experiment station botanist who had conducted a coöperative experiment on the grounds of a truck grower to test the efficiency of sulphur treatment to prevent celery leaf blight. The treated plants promised well, and one day he visited the place to make final notes in the field before the crop was harvested. Before reaching the field he saw the owner, and, asking him about the celery, was disappointed to learn that it had just been dug. "Oh, that is too bad," said he. "Well, I don't think so," remarked the owner, with a laugh; "I got two dollars a crate for it."

But most farmers are willing to do the fair thing when they know that the entomologist is working for a small salary to learn truths which may benefit them. I have known them to greatly inconvenience themselves in order to give him ample facilities for conducting experiments, the results of which were of no particular benefit to them, or at least not more so than to other farmers.

Of course it must be expected that the farmer will be more interested in the practical results of the experiments than he will be in any scientific value which they may possess, yet many farmers have a full realization of the necessity of a careful study of an organism to determine its life history as a means to an end—practical methods for its control.

We all find it difficult at times to answer the questions put to us by some of the growers, and their shrewdness is often amusing. I have known a correspondent to send insect specimens to his own experiment station for identification and at the same time send duplicate lots to a similar institution in another state and to the Bureau of Entomology at Washington. If the replies all coincide, presumably he gets the right name for the insect.

A further consideration of the matter only makes it more evident that the official entomologist in order to be efficient in his helpfulness to the farmer should do something more than write long-range prescriptions. He can go to the field occasionally, view the conditions, and will then probably prescribe differently and more to the purpose.

The farmer will know him better and will soon have more confidence in him.

The entomologist, too, will have more respect for the farmer and his methods, and more interest in him and his particular problems because of the contact. It will prove mutually advantageous.

The literature of economic entomology has been discussed several times in the meetings of this Association, but I wish to mention it here on account of its bearing upon my subject. Some official entomologists publish annual reports. Others publish in the reports of the institutions with which they are connected, and such reports appear to be a fit place to publish the full accounts of any experiments or investigations, or descriptions of methods and technique. Descriptions of new species or important facts regarding the life history or habits of an insect should be published in monographic treatises or in entomological journals. These publications are of great service to other workers, but do not as a rule appeal to the popular mind, especially if somewhat technical in their nature.

The popular bulletin or circular fills a distinct place in the list of publications of any official entomologist or experiment station worker —and I believe this has been conceded by those who have previously discussed the matter. Such a bulletin should give a brief, concise, non-technical account of the insect and directions for its control. Though we can place no definite limits as to the size of such a bulletin or circular, in general it should be brief. Often all that it needs to contain can be told in four or six, and seldom requires more than twenty-four pages. If very long, it should be provided with a table of contents and a brief summary. Illustrations are of the utmost importance in the popular bulletin, but they should be good ones. Photographs of insect injury are usually better than drawings, and the larger species can be shown very well in photographic illustrations. There are many details, however, that can be shown only by drawings, and zinc cuts are often used for all the illustrations.

Such a bulletin as I have mentioned is usually sent to all names on the mailing list. But there is frequently a demand for another form of imparting information, and some experiment stations issue special bulletins or circulars either to convey brief, timely information or to assist in the correspondence. Several forms of these have been given a trial at the Connecticut Station at New Haven. For instance, aside from our numbered series of reports and bulletins, we issue occasionally the "Bulletin of Immediate Information," which is mailed, not to the names on the regular list, but to a certain class, such as fruit growers, truck growers, dairymen, or nurserymen. This

publication is supposed to contain timely information not important enough or of enough permanent value to go as a regular bulletin. Like the other bulletins and reports, it requires a special wrapper for mailing, and can be sent out under the usual frank. We have also used for the same purpose the "postal card bulletin" for short articles of timely information. These are printed on postal card stock 4 x 7 inches in size, with the frank and space for the address on one side and the printed message, with possible illustrations, on the other.

These publications all have their place, and are of value in imparting timely information, and are of great convenience to the official entomologist as an aid in answering his letters. But none of them can be sent out in quantity without a mailing list and considerable work in addressing envelopes.

During the past summer another method has been tried which has long been in use by advertisers. We call it the "correspondence slip" or "dodger," and it consists of a single sheet of paper of the proper size to go into the letter envelope without folding. It may be printed on one or both sides, and is adapted for only very brief messages. Where possible a characteristic illustration is used in one corner, and perhaps the seal of the institution in another. These slips are not mailed to any list of names, but are simply placed in all the letters sent out from all departments of the institution at the time when the information will do the most good. They are also enclosed at other times, when the correspondent needs the message which they bear. In this way they reach many names not on the regular mailing list, and serve the purpose of calling attention to the work of the institution perhaps outside of the particular subject of the letter, and also outside of the department where the letter was written. They bear no date, and therefore are just as good a year hence as today, provided there has been no change in our knowledge of the facts or of the best method of treatment. So far only six of these slips have been prepared, and each has been printed on a different color of paper, but of course the list of tints would soon be exhausted. Press bulletins are also in vogue at some institutions, and serve their purpose admirably.

I realize, however, that many entomologists through no fault of their own are unable to bring forth publications that could be considered as ideal or even satisfactory. The plans are made by others higher in authority, and the rules of the institution prevent the entomologist from carrying out his own wishes and ideas. Perhaps there are scanty funds for publishing; or so much attention is required in teaching that there is no time for anything else. Such conditions, of course, are to be deeply regretted.

Fellow-members, it is truly a matter of congratulation that we now have so many young and earnest workers in the field of entomological research, and each one doing the best he can. There are many problems yet unsolved. Let every worker rejoice in the opportunity. There is a chance for each to contribute his full share in the days to come, for the good of the whole race.

The next paper on the program was entitled "A First Course in Economic Entomology," by F. B. Lowe, Detroit, Mich.

A FIRST COURSE IN ECONOMIC ENTOMOLOGY

By F. B. LOWE, *Detroit, Mich.*

[Withdrawn for publication elsewhere.]

At the close of this paper, the session adjourned.

Afternoon Session, Tuesday, December 28th, 1909.

The meeting was called to order at 1.15 p. m. by President Britton, who called Second Vice-President Summers to the chair.

CHAIRMAN SUMMERS: The next thing on the program will be the discussion of the presidential address.

MR. SANDERSON: All of us certainly appreciate and are in full sympathy with the remarks of our President made this morning concerning our relation to the farmer. One of the greatest factors in securing the application of the methods of insect control devised by the entomologist is in the entomologist keeping in touch with the farmer and putting himself on the farmer's level so that he can appreciate his viewpoint and can make such suggestions as will appeal to the farmer. One of the greatest aids in this work is the actual demonstration of the methods advised in the field. Where these methods are used, it is wonderful how readily many farmers will take up new methods. I remember when the first work was done on the boll weevil in Texas and we felt that it would be some time before we could secure the adoption of the methods devised by the planters, but owing to the demonstrations which were carried on thruout the state, it was but a few years before the method of cotton growing was largely revolutionized. It makes but little difference whether one is working in the West or in the East, the North or the South, if the farmer is approached in this way. When I commenced an agitation for spray-

ing in New Hampshire four or five years ago I thought it would be many years before any large number of our farmers would be spraying their orchards, but during the last year there were over 400 who did so. That is a small number, but the state is small, and it shows a tremendous progress in a few years.

MR. HITCHINGS: Our President referred to the exhibits made at the fairs and similar associations in the state, and I think that this is a very important factor in our work, as by such exhibitions we come in contact with many farmers. In the past two years, however, we have had so many demands in this line that we could not attend to all of them.

MR. FELT: I wish to express my personal pleasure and gratification at the address delivered by our President this morning. I think, in reference to circular letters, however, that these should be used with discretion. In New York state, I fear the recipient of such a letter would pay undue attention to things which are not of primary importance. I prefer to deal directly with the local conditions of the correspondent.

A MEMBER: We do not as a matter of practice use circular letters, but I recognize the practicability of giving certain information in that way. I believe our experience has justified this, and of course in certain instances I feel it is better to give the information desired, and not allow the recipient to draw his conclusions, according to his own understanding of the matter.

A MEMBER: I think that point of Doctor Felt's will appeal to some who receive circular letters. If a question is asked one of our inspectors, and the man receives a letter, he will appreciate it very much more, and will take advantage of the suggestions made much more often, than if a brief letter is written him, and a circular tucked in. In some cases it might be better to write a few more letters and give more detail to the man who applies for information, rather than send out a great number of circular letters that would never be read.

MR. HEADLEE: We think that it is a great mistake to send all publications to every member of our mailing list. A man who opens a large number of franked envelopes and finds nothing of value is likely to develop the habit of throwing such matter unopened into the waste basket. In fact, I think that this habit is now so well fixed in certain quarters that to insure especially important information reaching the person for whom it is intended it is necessary to enclose it in a regular two-cent envelope. The mailing list should be so revised for each mailing that the information will always be sent where needed.

MR. HEWITT: I wish to thank our President for his very excellent

and suggestive remarks, and I would also like to add my experience to that of Doctor Felt. I think that the entomologist should in all cases coöperate with the farmer or fruit grower, as the case may be. By distributing circular letters in this way, you are liable to be treated with scant courtesy, whereas if you send a man a letter, if only a few lines, you will be able to deal with his particular case, and he will be more likely to reply to your letter.

I do think we can hardly be too careful about our correspondents, as to the results obtained by carrying out our recommendations. I always endeavor to ask the correspondent to kindly give me the results of the application or the suggestions.

In regard to the distribution broadcast of these circulars, take an extensive country like Canada, where you have entirely different conditions to meet in Quebec, in Ontario, and in British Columbia, and you will see that it is impossible to deal with these widely separated provinces by a circular letter, giving the same remedial measures, and although in some cases a very large correspondence may be entailed, I find it is better for ourselves and for the correspondent if we pay as much personal attention to his inquiries as possible.

I am sure we have all been deeply interested in the points which our President raised, and I should like again to thank him.

PRESIDENT BRITTON: I might say here that it was not my intention to suggest that circular letters be used entirely; but it is a question whether we should spend so much time in copying over and over again formulæ for making Kerosene Emulsion and Arsenate of Lead, or whether it would not be better to have these formulæ printed and include one with a personal letter.

MR. WASHBURN: The entomologist can, of course, tell whether he is successful in using this printed matter. Our experience in Minnesota is to send the advice to a farmer, and that is the end of it. They might possibly tell us the results of this advice, if we were to write for it, as suggested by Mr. Hewitt. Most of the farmers will not take the time or trouble to write.

MR. HEWITT: In reply to Professor Washburn, I have unfortunately had only about three months' actual experience in Canada, but in the old country, where I had a wide correspondence with the farmers and others, they were always willing to coöperate with the entomologist, and in Canada I have found on the part of the more educated farmers men who are willing and interested enough to inform me of the results of the experiments.

MR. PARROTT: All I wish to say is that I am thoroughly in accord with our President's views. The entomologist's correspondence is

rapidly increasing and we find in our own experience that printed circulars very much simplify the work of correspondence. We employ the leaflets to supplement our letters.

MR. SANDERSON: The idea of following up a letter at the proper time with another one to ascertain whether the advice or suggestions have been followed out has appealed to me, but I have not been able to definitely prove the value of such a scheme when carried out systematically. At our station we have adopted the scheme of making a card record of all inquiries of correspondents by the subjects of their inquiries. There is cross reference to another card catalog arranged by post offices. This enables us at any time to refer to all of the inquiries we have had upon any one of the leading subjects upon which we have frequent inquiries. It has been my feeling that if occasionally we could send a letter to these parties asking whether they had followed out our suggestions and if so what the results were, that we would find that in many cases the suggestions had not been properly carried out and only partial success or failure had resulted. This would be brought out by such correspondence and the correspondent could be advised as to his trouble. Thus failure which would be blamed on the station might many times be prevented. This is simply the application of the methods used by every business office to the work of station correspondence, and altho possibly it should come under the work of an extension department rather than that of an experiment station, it seems to me that it is highly desirable that some such scheme be carried out.

MR. WALDEN: The timely information slips are prepared just in advance of the proper time to combat the insect or disease to which the slip refers, and are distributed among the different departments of the Station to be inserted in all correspondence. For example, a man may write to the Station inquiring about fertilizers; the chemical department will reply to this letter and enclose a slip regarding, perhaps, the canker worm. The man may be interested in this matter, and if the slip does not contain sufficient information will write to the entomological department for more detailed instructions.

We have in this way received inquiries from men who perhaps were not familiar with work of our department, and I think we get in touch with more people through these slips that we could in the ordinary way.

At 1.45 p. m. President Britton resumed the chair and called for the next paper on the program, which was read by Mr. E. P. Felt, Albany, N. Y., as follows:

OBSERVATIONS ON THE HOUSE-FLY

By E. P. FELT, *Albany, N. Y.*

An attempt was made the past season to obtain accurate data respecting this insect's behavior toward light. The principal object of the experiment was to determine the possibility of storing manure and other substances in which this pest breeds, in dark or nearly dark cellars or compartments.

Outline of Conditions. A fly vivarium was located in the writer's back yard (a typical village lot) at Nassau, Rensselaer County, N. Y. This building was a nearly light-proof structure 6 x 10 feet in outside dimensions and with a height of 6 feet 4 inches in front and 5 feet 6 inches in the back. To facilitate the location of materials, etc., the spaces between the joists were numbered consecutively, beginning at

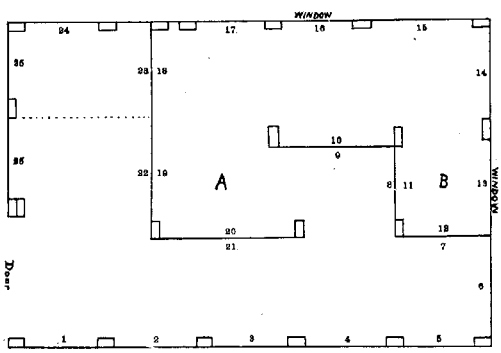

Fig. 1. Plan of fly vivarium (original).

the door on the north wall and running around and including in the enumeration the spaces of the partitions as well as the outside wall (Fig. 1). A light-proof window (18 x 18 inches) was made in the south wall near the southwest corner (at station 16) and another in the west wall (at station 13). Light-proof partitions, arranged somewhat like those in a photographer's dark room, divided the interior (Fig. 1) in such a manner that there was a constant decrease in the light as one progressed from the door back through the partitions and around to the darkest corner near the middle of the south end (station 12). Ventilators were provided in the roof at A and B (Fig. 1). There is in the southeast corner, at station 23, a small closet 21 inches deep and 3 feet above the ground. The interior of the building was painted a dull black the latter part of April. The door located at the

northwest corner is 26½ inches wide and 71¼ inches high. This door was allowed to remain open throughout the season, and the entrance of animals or children prevented by the use of a coarsely screened (½-inch mesh) door having an interior clear space of 23 x 67 inches. The building was so situated that August 24, at 8 a. m., rays of the sun reached back to the base of the corner of station 8 and a little later in the day would extend to the base of the pail at station 6. There was sufficient illumination under these conditions at station 18 so that one experienced little difficulty in discerning objects located there. Mackerel kits containing horse manure thoroughly sterilized by steam were placed at stations 6, 12, 18 and 23. The vivarium was located about 20 feet from one barn where a horse was kept, the manure from the animal being thrown outdoors. There was another barn, where at least two animals were kept throughout the summer about 40 feet away to the southwest and another barn about 50 feet due east. This latter had been occupied in previous years by six to eight horses, and when the vivarium was constructed it was expected that an equal number of animals would be kept in the building throughout the summer. Owing to a change of plans but one horse was kept in this barn, and as a partial result of this change there have been considerably fewer flies than in previous years. Furthermore, the excessively cool weather continuing well into June greatly delayed the appearance of the house-fly in numbers. Relatively cool weather continuing throughout the summer has also served to prevent rapid breeding. This combination of causes has resulted in house-flies being much scarcer than usual.

Experiments. House-flies were becoming somewhat abundant June 23d and operations were commenced by placing mackerel kits nearly filled with sterilized horse manure, at stations (see numbers on figure) 6, 12, 18 and 23. House-flies becoming more abundant the latter part of July, another set of pails with horse manure was placed at the stations indicated above and, in addition, one just outside the door. Rather abundant rains kept the last named pail nearly full of water, and numerous Muscid larvæ were observed in the contents the remainder of the season. House-flies entered the vivarium freely, being rather numerous at station 23 and frequently working back to station 6. Muscid larvæ were in pails at both of these stations and one, which may possibly have been a Musca, at station 12. Fruit flies, Drosophila species, were observed in numbers July 21 at station 6, evidently being drawn in part by swill placed there for the purpose of attracting flies. This species was very numerous about the pail, alighting in numbers on the walls above, but scarcely penetrating into the darker portions

of the vivarium. *Psychoda alternata* was relatively abundant in midsummer about stations 23, 6 and less so at station 12. Toward the end of the season some were observed at station 18. This latter occurrence may possibly be explained by a mouse burrow admitting a small amount of light in the near vicinity of the pail.

Conclusions. The above data, while not so conclusive as could be desired, show that the house or typhoid fly does not breed freely in darkness. This pest exhibits a decided preference for sloppy filth in light places. It is practical and thoroughly in accord with the best agricultural practice to either draw out and spread manure at frequent intervals, or to store it in cellars or sheds. The relatively cheap cement underpinning makes it comparatively easy to construct dark cellars, places where manure or other fly-breeding material can be kept without producing swarms of flies. These measures, while particularly adapted to the farm, will also prove of service in villages and cities.

MR. HEWITT: As one who has been working on this question for some years, I should like to thank Doctor Felt for his interesting paper. I have found my own observations exactly coincide with those of Doctor Felt; that is, that flies breed more abundantly under bright conditions than in dark places, although the flies crawl down into the dark crevices to deposit their eggs.

A MEMBER: Will not flies oviposit in the manure before it can be removed to the dark cellar or pit?

MR. FELT: I think it makes no particular difference whether the eggs are deposited in the manure or not, since, if there is considerable breeding, it is comparatively easy to arrange a light though flyproof trap which would attract the flies and prevent the insects escaping from the manure cellars or pits.

MR. COOLEY: I would like to ask whether the temperature interferes in any way. Was the house as warm as the area outside?

MR. FELT: If Professor Cooley could have entered the fly vivarium, he would have agreed that the flies had a pretty warm reception. It was quite warm at times. The house is standing, and will probably be used another year.

PRESIDENT BRITTON: The next paper on the program will be read by Professor Sanderson, Durham, N. H.

CONTROLLING THE BLACK FLY IN THE WHITE MOUNTAINS

By E. DWIGHT SANDERSON, *Durham, N. H.*

In 1904[1] Dr. C. M. Weed showed that the larvæ of the black fly might be destroyed by an application of phinotas oil and later Mr. A. F. Conradi, who performed the experiments, gave a further report.[2] The experiments at Dixville Notch conducted at that time were entirely successful, and but very little trouble has been experienced from black flies in that locality since then.

For the past few seasons the residents at Appalachia in the valley immediately north of the Presidential Range, have been greatly annoyed by the black flies and appealed to us for some practical means of controlling the pest. It was found that the neighboring streams were alive with the larvæ, and in view of the previous experiments it seemed entirely feasible to destroy them by the use of phinotas oil. My assistant, Mr. W. M. Barrows, spent the greater part of the month of July at Appalachia investigating the habits of the flies and in making experiments for their control. Two species occur commonly, the white legged variety (*Simulium venustum*) causing very little annoyance, the biting being done by *Simulium hirtipes*. The life history of these species is unknown in this region. There is a general belief among the inhabitants that the flies are to be found over winter in the timber, and reliable observations are given us of parties being troubled by the biting of the black flies high up on the mountains the second of October after there had been a heavy snow and frost in the valley. It has been supposed by some observers that the small larvæ passed the winter on the stones; in any event the flies are more numerous during early summer and again in later summer. In early July we found but few young larvæ and were unable to find the eggs, most of the larvæ being full grown and pupating. By the middle of July many flies were emerging from the pupæ. It is evident that if the flies hibernate they would be unable to deposit their eggs until after the high water of spring subsided. An accurate knowledge of the life history of the insect will be absolutely necessary in order to determine the best season for carrying on measures of control by oiling and will probably also have an important relation to the effect of the oil on the fish.

It was found that phinotas oil applied to the stream by throwing it

[1] Bulletin 112, N. H. Agr. Experiment Station.

[2] See Bulletin 52, Div. of Entomology, U. S. Department of Agriculture.

out with a cup in the rapids by a man wading down stream would destroy the larvæ effectively. The larvæ are found almost entirely on the rocks where the water flows over them very swiftly and breaks into rapids or spray. Rocks in smooth running water have very few larvæ upon them. In the preliminary experiments a net was stretched across the Moose River, a small stream 10 to 20 feet wide, and the water was oiled for a distance of 100 yards above the net. The man applying the oil can walk nearly as fast as it floats down stream and the fish descend the stream ahead of the oil. Where the fish were caught in the net many of them were overcome by the oil, but as it passed on and the water cleared up within 15 or 20 minutes, all revived and showed no subsequent ill effects. This experiment was repeated three times in which individual fish were overcome each time, but survived with no ill effect.

After these experiments it was determined to oil a considerable stretch of the stream, which was done in the same way. This application was entirely effective in destroying the larvæ, but unfortunately it resulted in killing a considerable number of the fish, due to the fact that the volume of oil was such that the fish descending the stream with it were subjected to it for too long a time. From our previous experiments we feel certain that had nets been stretched across the stream so as to catch the fish and so that they would not have been subjected to the oil for over 15 or 20 minutes, no trouble of this kind would have ensued. Our observations also lead us to the opinion that the oil might be applied much more economically by the use of a knapsack sprayer and a nozzle, preferably a Bordeaux nozzle, by which the oil could be applied directly to the worst affected rocks in a spray which could be directed immediately on them. This would use much less oil and would consequently have less effect on the fish. The method of merely throwing the oil in the stream with a cup forms an emulsion of the whole volume of water in the stream. The oiling was carried on both in the river, which has a gradual fall, and also in Cold Brook, which descends the mountain side very rapidly over large stones as shown in plate 2. The application was equally effective under both conditions. The numbers and position of the larvæ on the large stones in Cold Brook are indicated by plate 3, in which they are somewhat indistinct owing to an inch or two of water flowing over them.

From these experiments and observations we are led to believe that the destruction of black flies in the resort regions of our mountains is entirely as feasible as the control of mosquitoes in low country such as the vicinity of New York and New Jersey. To work out practical

Scene on Cold Brook Showing Rocks Seen in Plate 3

Rock in Cold Brook Covered with Black Fly Larvæ

methods will involve an accurate knowledge of the life history of the flies and of their ecology, and experiments to determine the effect of the oil on fish as applied at different times and by different methods. We hope to be able to carry on such investigations in the future, but as such work involves considerable expense, for which we have no funds definitely appropriated, the completion of the work may not be possible in the near future, so that it would seem well to call the attention of others to the work, since they may have a chance to give it the requisite study.

PRESIDENT BRITTON: We will now listen to a paper by Prof. C. P. Gillette, Fort Collins, Col., on "A New Arsenical Poison for the Codling Moth."

NEW SPRAYS FOR THE CODLING MOTH

By C. P. GILLETTE, *Fort Collins, Col.*

When Doctor Headden announced[1] his conviction that the arsenical sprays used for the control of the codling moth are, in many instances, killing the apple trees, he was asked to suggest some poison that would be less injurious to the trees and still give promise of killing the worms. He suggested trying sulfid of arsenic ($As_2 S_3$), and expressed the fear that it would not be sufficiently soluble in the digestive fluids of the larvæ to kill them. Knowing something of the great digestive powers of insects, I expressed to the doctor a very strong desire to try arsenious sulfid in comparison with arsenate of lead in some codling moth spraying experiments already planned for 1909. Doctor Headden first prepared a small quantity in liquid form which was tested upon different kinds of foliage in the insectary to determine the strengths that might be safely used upon the leaves.

It was nearly time to begin the work of spraying for the codling moth, and as we could not obtain a sufficient quantity of this poison near at hand for the experiment, Doctor Headden converted his experimental laboratory into a laboratory for the manufacture of arsenious sulfid.[2] Enough was made to use upon a few trees and was sent to

[1] Bulletin 131, Colo. Agr'l Exp. Sta.

[2] Doctor Headden describes his preparation of the poison as follows: The arsenious sulfid was prepared by the usual method, *i. e.*, precipitation by hydrogen sulfid. The washed precipitate was dissolved in lime-sulfur solution, usual strength. The lime-sulfur solution was used because it dissolves, or is assumed to dissolve, the arsenious sulfid to a sulf. arsenite without the formation of an oxygen salt, the arsenite which I wished to avoid, as

Mr. George P. Weldon, field entomologist of the Experiment Station, located at Delta, with instructions to use it in comparison with arsenate of lead. The arsenate of lead was being tested at 2, 3 and 4 pounds to each 100 gallons of water in one application only when the petals were about nine-tenths off.

The arsenious sulfid was used in two strengths to correspond with the two stronger preparations of arsenate of lead in amount of metallic arsenic contained.

The applications were made by Mr. Weldon with a hand pump with moderate force, but the treatment was thorough and in every way was made as nearly like the lead arsenate sprays as possible.

The results of the experiment as tabulated by Mr. Weldon are here given:

The trees sprayed with 2 pounds of arsenate of lead to 100 gallons of water averaged 94.7 per cent of their fruit free from all worm injuries. The trees that were sprayed with 3 pounds to 100 gallons bore fruit that was 95.5 per cent free from worm marks. Trees sprayed with 4 pounds to 100 gallons bore fruit that gave exactly the same percentage of worm marks as when 3 pounds were used.

The trees sprayed with sulfid of arsenic had 93.6 per cent perfect fruit upon trees sprayed with the weaker preparation, and 92.7 perfect from the trees where the stronger solution was used.

The check trees average 58.9 per cent sound, or perfect, fruit, so far as worm injuries were concerned.

All of the experimental blocks, both sprayed and checks, were in a large orchard, all of which was sprayed. Check trees in such a case benefit greatly by the spraying of surrounding trees and do not show the contrast that they should with the results upon sprayed trees. Two orchards in the same vicinity, one very poorly sprayed and one not sprayed at all, bore apples that were 70 to 85 per cent wormy.

So this test of sulfide of arsenic as a spray for the control of the codling moth indicates that this poison may be as efficient for this

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I am convinced that a pure preparation of lime arsenite is not good to use. The solution probably contains the whole of the arsenic in combination with sulfur. The lime-sulfur compound is easily decomposed by the carbonic acid of the air, while the arsenious sulfid withstands the action of water, air and carbonic acid very effectively. The sulfid of arsenics $As_2 S_3$ contains essentially 61 per cent of its weight of metallic arsenic, while lead arsenate contains less than 10 per cent (9.87).

The chief thing, however, is not that it may be placed on the market at a lower price, but that it will remain longer in the soil in an insoluble form than the compounds heretofore used. It is only a mitigation of the evil, however, not a complete avoidance of it.—W. P. Headden.

purpose as the arsenate of lead, which has, in the past few years, almost completely taken the place of other poisons for the control of the codling moth and other leaf-eating insects.

Three other sprays, viz., lime, Black Leaf Extract, and Sulfate of Nicotine, were also tested in hopes that they might prove beneficial. As with the arsenical sprays, each was used but once, as the petals were nearly all off.

Good lump lime, 50 pounds to 100 gallons of water, seemed to give no protection at all, as the percentage of perfect fruit on these trees averaged 58.9, exactly as in case of the check trees.

Black Leaf Extract was used in the proportion of 1 gallon diluted to 50 gallons with water. The trees sprayed with this mixture gave fruit that was 77 per cent free from worm injuries, or about 18 per cent more perfect fruit than in the check block.

Sulfate of Nicotine was used in the porportion of 1 part in 750 parts of water and seemed to give slight protection, as the trees sprayed with this mixture bore fruit that was 73 per cent free from all worm injuries, an improvement of practically 14 per cent over the fruit of unsprayed trees. Even this application indicates a protection of almost exactly 33 per cent of the fruit that would have been wormy if untreated, for the check trees had but 41.1 per cent of their fruit injured by worms.

While I would not feel warranted from this year's experiments in holding out very strong hopes that the codling moth can be sufficiently controlled by the use of nicotine sprays, I am encouraged to continue the experiment through another year and shall probably extend the number of applications to three or four. One or two summer sprays with either of these tobacco preparations will usually pay for themselves in their destruction of plant lice, red spiders and brown mites. And then, if these nicotine sprays will enable us to get fairly good protection from the injuries of the codling moth, it will be a boon to those whose orchards are already sick and dying from the excessive use of arsenical mixtures.

My chief hope, however, for relief from the overaccumulation of arsenic in our soils in a form that is detrimental to the growth of vegetation, lies in the use of the very insoluble sulfide of arsenic. This compound also has the important advantage of being very much cheaper than arsenate of lead, and if we can use it in solution it will do away with the use of stirrers in the spray tanks, which will be another decided advantage.

I have also used this poison successfully, as an arsenic-bran mash, for the destruction of grasshoppers, and as a spray for the destruction

of cherry slugs, and the larvæ of the white ermine moth, *Diacrisia virginica* Fab., but I did not compare the results in these cases with the effects of other arsenical poisons in parallel tests.

MR. J. B. SMITH: Will Professor Gillette please tell us how this poison is prepared and where it can be secured?

MR. GILLETTE: The poison was prepared for me by Doctor Headden and the method of making it is explained in the footnote given in the paper. I do not think it can be secured at present, unless it is made up specially for the purpose.

MR. FORBES: I realize that it is getting late, yet I think if the subject of arsenical poisoning on fruit trees is not taken up we will lose a great deal of information which should be of great value to the members of this Association.

Doctor Headden has been working on this matter in Colorado, and while some of his results may refer directly to Colorado conditions, I think the whole matter should be of great interest to our members, especially as some of us have conditions to deal with which are in a way similar to those in his state. I trust we shall have time to hear from Doctor Headden concerning this matter.

PRESIDENT BRITTON: We will be glad to hear from Doctor Headden.

ARSENICAL POISONING OF FRUIT TREES

By W. P. HEADDEN, *Fort Collins, Col.*

[Summary of remarks]

There are some facts in regard to which all agree, namely, that we have many sick fruit trees; particularly apple and pear trees. I do not for a moment wish to assert that all of these sick trees are suffering from arsenical poisoning, nor that all of the dead ones have been killed by arsenic. But I do believe that many of them have died from this cause. Other causes which might have produced death are winter killing, accumulation of nitrates in the soil, fungi of different kinds, possibly blight and still other causes.

The trees referred to have not been killed by freezing. We have very little of this in the state, and these cases present no similarity to those attributed to arsenical poisoning. The former in this latitude produces its injury above the surface of the ground, and the injury is really effected beneath the bark. Arsenic begins its attack below the surface of the ground and on the outside of the bark, converting

it into a black friable mass, which may be found of all thicknesses, from thin layers forming scarcely more than a discoloration to masses involving the whole thickness of the bark and the woody tissue underlying it. We find many trees showing this progressive destruction of the bark and tissues. The same statement holds good for the roots, which are attacked with the crown of the tree. Sun scald, a form of winter injury, is an entirely different thing, both in location and appearance; while the bark may be killed in spots, its structure is not destroyed. It is not a blight of any form; a large number of inoculation experiments have been made which have uniformly failed.

It is not due to the attacks of fungi; these have never been found in these trees in such association with the disease as to even suggest a causal relation. It is not due to drowning or excessive water, for we find cases of badly corroded crowns in localities where the water plane is many feet below the surface, and a permanent excess of water kills and rots the feeding roots. It is not due to alkali; whatever we may understand by this term, we have in some districts what is popularly designated "black alkali." This is not the "black alkali" of California; we have so far as I know absolutely no alkali in Colorado, consisting largely of sodic carbonate.

There is one occurrence of sodic carbonate in the state, which I described in the *American Journal of Science* April, 1909. That this so-called black alkali is dangerous and kills trees is true. The active agent in this case is some nitrate, calcic, magnesic or sodic. The crowns of trees killed by this are invariably healthy unless involved by the presence of arsenical poisoning, as may be the case in orchards that have been sprayed. I have seen many trees killed outright in a few days by these nitrates. The two cases, *i. e.*, death due to arsenical poisoning and death due to nitre poisoning, are *in toto* different.

I have seen one case in which the arsenic had lodged in the crotch of a tree and produced the same results as about the crown. This case was easily distinguished from the effect of snow, etc., lodged in similar places.

All that has been said so far pertains to the corrosive action of arsenic, but it may be justly asked how may we know that arsenic produces the effects described? Our answer is we have observed the destruction of the bark, the disintegration of the woody tissue and the killing of trees by arsenic.

So far I have referred to the corrosive action of arsenic when it accumulates in the soil about the crown of the tree. There is another phase of the question which I believe we find in some orchards much more pronouncedly than the one already presented, and this is the

question of absorption of arsenic by the roots with the nutrient solutions. We have some cases of trees decidedly small for their age; the bark has an unhealthy color, the foliage is small. The trees make very little growth and yield fruit of medium size but of very high color. We find some trees in these orchards with corroded crowns, but the trees to which I now allude are not affected in this way. Some of these trees have died, the heart wood was found to be stained, the bark was yellow and cracked and the woody tissue was rich in arsenic. The general condition of the orchards is one indicating malnutrition. Neither a lack nor an excess of water can be appealed to as factors in these cases, for the land is in all cases that I have in mind high and the supply of irrigation water abundant. There is, further, no deficiency of plant food in the soil, provided the results of a chemical analysis have any value whatsoever. All of the orchards in which I have found these conditions obtaining are well cared for, and the condition cannot be attributed to neglect. These trees often show bleeding from wounds made in trimming, also from longitudinal cracks in the bark. The material which collects on these wounds or flows from the cracks in the bark is rich in lime, 25 per cent calcium oxid, and also in arsenic. I cut off a limb in April and gathered 2.2 grams of the dried juice from the surface of the wound in early May and found it quite rich in arsenic. It seems evident that this arsenic must have been gathered from the soil by the roots, at least the arsenic was at that time in motion through the tree. I have further proof that the roots gather arsenic from the soil. The wood of peach trees not themselves sprayed, but growing in ground that contains arsenic, has been found to be quite rich in arsenic; leaves gathered from trees that had not been sprayed this season, but heavily sprayed during preceding seasons, contain arsenic, and fruit grown on such trees contain arsenic. In these cases there is no question of absorption of arsenic by simple contact with the spray material. It is in the solutions which diffuse through the tree and nourish all of its parts. This seems to me to reduce the question of systematic poisoning to the one question of how much arsenic a tree can tolerate. The small size of the trees and their general condition of malnutrition corresponds to the observed effects of arsenic in cases in which we know it to have been applied and produced the injury.

There is still another question, one which I have referred to whenever considering this subject, *i. e.*, what may be the significance of the lime in these dried juices? These orchard soils, in fact nearly all of our soils, are limey; much of our land is underlaid by marl; it is, however, also true that much arsenite of lime has been used for

spraying. Now nearly all, if not all, of these marls contain arsenic, but in small quantities compared with the surface soils. These things, apparently, all work together to produce the effects described, but neither the marl nor the arsenic in the marly soils can be blamed for the arsenic in the trees and the fruit, for this is a very widespread condition. I have examined fruit from the following states: California, Colorado, Michigan, New York, Illinois, Ohio and Pennsylvania and uniformly found arsenic. No one, however, need to be alarmed about the amount of arsenic present being in the least dangerous, for they would scarcely obtain an ordinary medicinal dose if they ate ten pounds of apples a day. Arsenic, however, can be detected in the urine of parties eating very freely of such apples. I will, however, reserve this subject for discussion elsewhere.

Mr. Headden exhibited samples of roots which had been injured by arsenical poisoning, as well as small tubes showing the results of analysis of fruit trees from various sections of the country, and one of these tubes contained a mirror which had resulted from the analysis of an elm tree that contained a considerable amount of arsenic.

MEMBER: I would like to ask whether Doctor Headden has noticed any connection between the appearance of arsenical poisoning and the amount of moisture. Is it more likely to appear in a tree standing in dry or wet soil?

MR. HEADDEN: Colorado orchards are irrigated, and it is possible that the arsenic is carried down to the roots sooner with us than where the soil is not treated in this way. Nevertheless, analyses have shown that sick trees on almost all kinds of soil showed the presence of arsenic in considerable quantities, if they had been sprayed.

MR. WASHBURN: I would like to inquire how Doctor Headden secures his samples, in order to determine whether the tree is suffering from arsenical poisoning, and how large a piece of bark would be necessary to detect the poison.

MR. HEADDEN: I have always endeavored, in taking the samples, to refrain from selecting any of the outer bark of the tree, as this is liable to be covered to some extent with poison, especially trees that have been recently sprayed.

The wood just below the bark is usually selected for this purpose, but in cases of root injury the woody tissue of the roots is used, but not the bark.

MR. WASHBURN: Is not this fact more striking in alkali soil? I

would also like to ask how much of the wood it is necessary to use as a sample in making an analysis?

MR. HEADDEN: In some cases I have found that a piece of wood an inch or two long and an inch wide would be sufficient to show the presence of arsenic. Generally I use about two ounces.

In a soil normally alkali and dry, some trees that have been sprayed from one to four times have shown effects of arsenical poisoning.

MR. SANDERSON: Does poisoning result from the insecticide coming in contact with the trunk of the tree, or are the roots alone affected?

MR. HEADDEN: I do not know how much, if any, poison may be absorbed by the contact, but where it collects about the crown it corrodes both the trunk and the roots.

MR. SANDERSON: Is there any more poison in the roots of the tree than in the trunk?

MR. HEADDEN: I do not know. I have separated the small branches and analyzed them and found abundant evidence of arsenic.

MR. FELT: How soon, after spraying, does a tree die?

MR. HEADDEN: I have known a young tree to die after three sprayings. Professor Gillette and I examined an old orchard, and not one of the old trees showed any effects of poisoning, but every young tree gave signs of the trouble. The age of the tree when first sprayed may make some difference.

PRESIDENT BRITTON: As Prof. F. William Rane, of Boston, is now present, we will listen to his paper on the present condition of the "Gypsy and Brown-Tail Moth Work in Massachusetts."

PRESENT CONDITIONS OF THE GYPSY AND BROWN-TAIL MOTH WORK IN MASSACHUSETTS

By F. W. RANE, *Massachusetts State Forester*

The work against the gypsy and brown-tail moths was placed under the State Forester by an act of the last General Court. Many changes in organization and previous policies have been made. The infested territory has been divided into fifteen divisions instead of six as heretofore, and the force of experts now responsible to the main office is nineteen as compared with fifty. The superintendents of divisions have been provided with motor cycles, and the State Forester feels confident that the organization is capable of doing more effective work than ever. The work of spraying has increased in usefulness and thereby much of the more expensive hand suppression work like turning of burlaps has diminished. The Department of State Forester has established a supply store, which is proving a great saving of

money in the purchasing of supplies. The organization of local workers so as to accomplish more effective results is being undertaken at the present time.

The number of acres sprayed throughout the infested district during the season was 7,776, the number of burlaps put on 698,597, and number of tanglefoot bands 26,313. We have 150 power sprayers and 250 hand outfits employed in the work.

These figures are of course approximate.

Parasites. The introduction of parasites into the field has been carried on more effectively than ever before. The United States Government entomologists assure us of more hopeful indications than ever from their work.

The State Forester is having prepared a special report on the parasitic insects that will, it is believed, prove of great interest to our people.

The fungous disease and wilt disease of the moths are also receiving attention by noted experts, and it is hoped beneficial results will be forthcoming from these sources.

Prospects for the Coming Year. The prospects for the coming year look very bright. It must be recognized that this work necessarily must take time and patience on the part of our people, but with better equipment and a thoroughly organized corps of men ready and willing to exert themselves when the work must be done will go very far towards balancing conditions until the insects can be brought under control.

Modern Forestry and Insect Warfare. The more the subject of modern forestry is studied the clearer is it shown that if forestry practice was carried on as it should be for economic results, the great expense incurred in fighting insect pests like the gypsy moth would be reduced to a minimum.

The gypsy moths give us the greatest trouble in wild, neglected woodlands and in thickets and tangles found along the highways, or on poorly kept estates.

One thing our people cannot help but recognize is that where modern methods have been practiced through thinning and exercising some sort of management for the good of the trees, here conditions are not as bad as elsewhere. Then, again, under the latter management, should the infestation increase, the conditions are so much more favorable that the expense of warfare against the pest is greatly reduced.

It is really possible that the gypsy moth scourge may cause certain sections to practice modern forestry and thereby in the end gain

financially in getting a better forest product, both in volume and quality, than would have happened had the insects never appeared.

From the experience gained already, we have demonstrated that where we have a clean stand of pine the forest can easily be protected against the gypsy moth. There are few species of forest products worth more than white pine to grow commercially at present here in Massachusetts. What is true of the pine is more or less true with other evergreens, hence in the gypsy moth infested territory it is good forestry to grow these species.

The first thing to be done, therefore, with all woodlands is to practice modern forestry management for the benefit of future products regardless of gypsy moths or other depredations; then let come what may conditions are of the best to overcome them.

There is little to be gained in treating egg clusters and combating moths on dead or ill shaped and weed trees and stumps, as one's efforts ought to be centered on those that have prospective value.

We are recommending, therefore, that everyone begin at once to practice modern forestry management and then the insect warfare will be greatly reduced.

PRESIDENT BRITTON: We will now listen to a paper by Mr. A. F. Burgess, Washington, D. C.

SOME INSECTICIDE METHODS USED IN COMBATING THE GYPSY MOTH

By A. F BURGESS, *Washington, D. C.*

From the time that the gypsy moth first became destructive in Massachusetts and active measures were begun to secure its control and suppression, an effort was made to devise cheap and effective means of attaining that end. The results of a large number of experiments have brought about the adoption of a system of treatment throughout the year, which is very effective in controlling the pest, although the expense involved precludes its use in woodland areas of low valuation. The purpose of this paper is to point out some of the methods which have been found effective, and draw attention to their possible utility in combating other insect pests. It is hoped that this may lead to a discussion of the methods used and that it will be possible for some of them to be tried experimentally in other parts of the country.

Treatment of Egg-Clusters. The egg-clusters of the gypsy moth are laid in masses which are covered with hair from the bodies of the

females. The best method of destroying the eggs is by saturating the masses with crude coal tar creosote. To this material is usually added a small amount, about 5 per cent, of coal tar so as to discolor the treated clusters.

In parks and on city streets, where valuable shade trees have been planted, this method might be employed in treating egg-clusters of the white-marked tussock moth, *Notolophus leucostigma*, as this insect sometimes becomes a great nuisance in such places.

As an illustration of some of the methods that have been employed it might be stated that during the present year many of the shade trees in Washington, D. C., which were badly infested with egg-masses of the insect, are being treated by the workmen employed by the District of Columbia. The egg-masses are being burned off the branches of the trees by using a gasoline torch. If it is desirable to destroy these eggs the creosote method would seem to be preferable. It is a well-known fact that the eggs as well as the pupæ of the insect are sometimes attacked by hymenopterous parasites, and in cases of heavy infestation it might be desirable to collect these masses, place them in suitable outdoor cages for the purpose of rearing of parasites in order that these beneficial insects could be liberated, after which the young caterpillars should be destroyed.

Treatment of Larvae. Most of the members of this association are probably familiar with the burlap method used in the gypsy moth work. Trees are banded with strips of burlap cut about eight inches wide. The burlap is fastened with a string at the center and the top turned down in such a manner as to make an excellent hiding place for caterpillars. A large number of different species of insects frequent these burlaps, and in some sections quantities of such injurious species as the elm-leaf beetle in the larval and pupal stages are often found beneath them. An adaptation of this method might be used in the fall of the year on the base of the trees, for the purpose of furnishing hibernating quarters for injurious insects. I have been informed by Mr. C. W. Prescott of Concord, Mass., that he has been able to capture and destroy large numbers of hibernating asparagus beetles by using this method. It is cheap and in some cases may be used to good advantage.

Banding trunks of trees with tanglefoot, a sticky material which prevents caterpillars from ascending them, is being used more extensively each year in the gypsy moth work, and although a method involving a similar principle has been used for many years, viz.: banding apple and elm trees with tar or printers' ink for the purpose of preventing female canker worms from reaching the small twigs or

branches, it might be well to mention the successful use of the material.

The greatest advance in the perfection of methods for destroying the gypsy moth has been along the line of new spraying devices. Previous to the year 1900 hand pumps mounted on barrels or hogsheads were used for furnishing power. Since that time gasoline engines have been utilized to a greater or less extent, especially in the large fruit-growing districts throughout the United States. This method was tried in the gypsy moth infested territory after the work of suppression was resumed in 1905. A gasoline engine with a suitable pump mounted on wagon trucks with a spray tank having a capacity of 300–500 gallons has been employed. The Vermorel or Bordeaux nozzles and lines of ½-inch hose were used, and it was necessary to climb tall trees in order to treat them thoroughly. It was not possible to cover very many large trees in a day when an equipment of this sort was used.

As early as 1895 a steam spraying outfit was devised and used in Prospect Park, Brooklyn, New York, by Mr. J. A. Pettigrew for treating trees for the elm-leaf beetle. With this outfit high pressure was developed, so that the trees were sprayed from the ground. A description of the sprayer was published by Dr. L. O. Howard in an article entitled "The Use of Steam Apparatus for Spraying," in the Yearbook of the United States Department of Agriculture for 1896.

After Mr. Pettigrew was made Superintendent of Parks of the City of Boston he continued to use a similar outfit for treating elm trees infested with this insect.

In the spring of 1905 the "solid stream" method of spraying was tested by General S. C. Lawrence of Medford, Mass., the trees treated being badly infested with the gypsy moth. The outfit used was built by the firm of Stephen B. Church of Boston, the power being supplied by a high power gasoline engine. The experiment was entirely satisfactory, and since that time this system of spraying has come into general use on the gypsy moth work. Mr. George H. Kermeen, one of the representatives of this firm, was an early advocate of the method and through his efforts many people were interested in its use.

It should be stated that the successful application of the solid stream spray requires a high power engine, a strong pump equipped with a suitable air chamber and a nozzle constructed in such a manner that the stream will be carried to the top of high trees before it breaks into a mist. For park and woodland work, where trees from 50 to 75 feet in height are to be treated, the best outfits now in use are provided with a ten horse power gasoline engine of the marine motor or auto type and a triplex pump capable of discharging at least 35 gallons a

minute. One and one-half inch hose is used, and nozzles similar to those supplied with fire hose are fitted with adjustable tips of 1/8, 3-16 and 1/4-inch aperture. A U-shaped tank of from 400 to 600 gallons' capacity is mounted on the front of a set of wagon trucks and the machinery on the back part.

Since this method of spraying was adopted many improvements have been made by manufacturers. This has been due largely to suggestions made by the officials engaged in the spraying work and has resulted in a great increase in the efficiency of the machines.

In field work it is usually desirable to use a one-fourth-inch nozzle tip and to maintain a pressure above 200 pounds.

With an outfit of this sort about 12 acres of woodland can be treated each day at a cost averaging $10 per acre. When forests are sprayed it is necessary to lay long lines of hose from the machine, which whenever practical is located near a supply of water. Effective work has been done when the spray mixture had to be forced through a hose over a quarter of a mile in length.

Mr. D. M. Rogers, Special Field Agent of the Bureau of Entomology, who has charge of the gypsy moth field work in New England has devised an apparatus known as a "water tower," which is mounted on the top of the spray tank and is used for treating roadsides. It consists of a steel tube about 20 feet long, which is attached to a mast six feet high. The bearing on the mast, which is about four feet from the end of the tube, is fitted with a universal joint, so that the nozzle, which is attached to the outer end of the tube, can be moved in any direcion desired by the operator. The short end of the tube is reinforced with a quantity of lead so that the tube nearly balances on the mast. The supply hose is attached to this end, and by using this device it is possible to spray two miles of roadway in a single day at a cost of less than $2 an acre.

During the past few months a new sprayer has been devised and built by Messrs. L. H. Worthley and Melvin A. Guptill of the Massachusetts State Forester's office, which has given very satisfactory results. Special care was taken to overcome the objectionable features of the machines previously built, and it was possible to do this and at the same time decrease the weight of the outfit and add to its efficiency. A new type of nozzle has also been devised by these gentlemen and a coupling which does not reduce the diameter of the hose at the point of connection. These devices will be exhibited and demonstrated before the close of the meeting.

The spraying outfit used on the gypsy-moth work should be of spe-

cial value for treating trees in parks and cities, and in most cases they can be used for such work without any special modification.

For orchard spraying or treating low-growing trees, the same system could be used, but it would be necessary to reduce the weight of the outfit and make changes that would render it more suitable for this class of work.

All spraying must be done rapidly and thoroughly if satisfactory results are secured. This system of treatment seems to answer these requirements, and if modified sufficiently to conform to the special kind of work desired it should give satisfactory results.

MR. HEADLEE: Has the dust sprayer been used in Massachusetts on the gypsy moth work? I noticed in the exhibition room an apparatus for spraying trees, using dry arsenate of lead, and would like to know what success has been attained with this method of spraying.

SECRETARY BURGESS: So far as I know, the dust method of spraying has not been used on the gypsy moth work. Last season some experiments were conducted with a bomb made somewhat similar to the bomb shells used for fireworks. This shell carried a charge of dry arsenate of lead, which was shot up into the air and exploded, so as to distribute the poison over the trees below. Its only use is in inaccessible woodland areas, where it is impossible to use a wet spray. This device is only partially successful; one of the troubles being that it was not possible to secure a grade of dry arsenate of lead which was fine enough to be distributed evenly over the trees.

MR. FROST: The gypsy moth problem in New England is a most extensive one, and owing to the large areas of woodland which are infested, I believe at the present time is more of a forestry problem than an entomological problem. The forest area which is infested is largely covered with deciduous trees, which suffer greatly from the attacks of the insect. Last winter the gypsy moth work was placed in the hands of the state forester, and I am inclined to think the problem can be worked out better along forestry lines.

While in Europe during the past summer, I was surprised to note the large number of coniferous trees which exist, as compared with the relatively small areas covered with deciduous growth.

It seems to me that this may be one factor in holding the gypsy moth within bounds in that country, as the young caterpillars cannot feed upon coniferous trees.

I am inclined to think it will be necessary to reforest large areas in the gypsy moth infested district, by replacing the hardwoods with

pine. By following up this method, it will be possible to control to some extent the damage caused by this insect.

MR. HEADLEE: Do I understand that a new coupling has been devised for use on the gypsy moth work? We have had considerable trouble with the couplings which we have used on hose in our spraying work, and I would be glad to hear more about this plan.

MR. RANE: Mr. Worthley and Mr. Guptill have devised a new style of coupling which has proven of great value in the gypsy moth work. I hope Mr. Worthley will explain the coupling fully.

MR. WORTHLEY: One of the troubles which we have always had in our spraying work has been that the diameter of the hose at the coupling was considerably reduced, when we used those now on the market. This being the case, it has been necessary to use 1½-inch hose in order to carry a sufficient amount of liquid.

The new coupling which has just been devised is of the same size as the inside of the hose, so that the stream is not choked when passing through the coupling.

This will enable us to use 1-inch hose, and will reduce the expense of equipment and the labor involved in laying lines of hose for spraying operations.

MR. SHERMAN: The last few papers on the program have detailed two radically different methods of spraying, and the remarks made by Doctor Headden seem to indicate that we should depend on some other method than heavy arsenical treatment in order to control leaf-eating insects. These matters are of great interest to the entomologist and should be more thoroughly investigated.

MR. FROST: I would like to make some remarks in regard to the injury to trees as a result of spraying with arsenical poisons.

Since 1896 we have repeatedly treated many trees, of all kinds, with arsenate of lead, and in this work have used about one pound to ten gallons of water. In spite of this fact, I have failed to see any trees which showed signs of injury from the poison.

Many people are prejudiced against spraying if they are led to believe that the trees will be injured, and this has caused considerable trouble and annoyance in the past.

It seems as though, if the trees were going to be injured by arsenical spraying, many of them would have died from this cause in eastern Massachusetts, but I have been unable to find any indications of this trouble.

MR. WORTHLEY: I would like to ask Doctor Headden if forest and shade trees are injured by arsenical poisons in the same way as orchard trees.

MR. HEADDEN: The only record I have along this line is the case of an elm tree which had been sprayed. Analysis showed a large amount of arsenic in samples taken from this tree.

MR. GILLETTE: It is probable that orchards will ordinarily suffer more than forests, for the reason that most of them are cultivated, which serves to work the poison into the ground and bring it in contact with the roots more rapidly than would be the case in forest areas. If the orchard is irrigated, this would also tend to convey the poison to the roots more readily than if artificial watering was done.

PRESIDENT BRITTON: While we are discussing the gypsy moth, I think it will be well to hear from the officials in various New England states who are engaged in the work of suppressing this insect, and I will now call on Professor Hitchings from Maine.

MR. HITCHINGS: Our work in Maine has followed along the same lines as that in Massachusetts. We, in Maine, have felt that we could not improve on the system adopted in Massachusetts, where the insect has been fought for many years, as our conditions are quite similar, and therefore we have been carrying on the work in the same way.

In Maine, the field work is in charge of a special agent appointed by the Commission of Agriculture, who has charge of the men. The force is divided into sections, and we feel that very effective work has been done in controlling the insect and keeping the infested section in good condition.

The situation at the present time is a serious one, and it is necessary for every effort possible to be put forth, in order to hold our own in the conflict. Our investigations lead us to believe that in some localities the young larvæ of the gypsy moth must have been carried by birds or four-footed animals. The locations of some of the colonies in the woodlands gives strong evidence that this is the case.

PRESIDENT BRITTON: I notice that Captain Philbrook is in the audience, and as he is the special agent, having charge of the field work in Maine, I know you will all be glad to hear from him.

MR. PHILBROOK: I don't know as there is anything to add to that which has already been said.

I might mention one point which has not been touched upon—in regard to the spreading of the moth—and that is that invariably in woodland colonies we find that at some time previous a portable sawmill has been temporarily located in the vicinity. In some cases these sawmills have been shipped from localities badly infested with the gypsy moth, and this evidence shows that the insect can be distributed in this way.

So far as Maine is concerned, the conditions in the towns are very good.

We find this year that there are several large colonies in the deep woodland which had not previously been discovered.

PRESIDENT BRITTON: We would now like to hear from Col. Thomas H. Dearborn, who has charge of the gypsy moth work in New Hampshire.

MR. DEARBORN: I have been much interested in the gypsy moth discussion which I have listened to this afternoon. We have in New Hampshire a large infested area, although the greater part of it was not known to be infested until within the last two years. Within a week, a force of gypsy moth men have found in a woodland near Durham, N. H., a very bad infestation, and this leads me to believe that the insect has been established in woodland areas in the state much longer than we have suspected.

Numerous other colonies strengthen this opinion, and I am inclined to think that if the woodland area of the state could be examined many large colonies would be found which have been present for a good many years.

PRESIDENT BRITTON: I do not see Professor Stene in the audience. Is there anyone who can report from Rhode Island?

MR. POLKE: I am not in charge of the moth work in Rhode Island, but have worked with Professor Stene and am thoroughly acquainted with the conditions there.

We have copied Massachusetts as regards the methods which are used for fighting the gypsy moth, and I fear we are going to copy Massachusetts too far, in that there is serious talk of withholding our appropriation at the coming session of the Legislature.

The condition of the infested territory in Rhode Island is improving each year, and if we are able to bring sufficient pressure to bear on the Legislature, so that the appropriation for the work will be continued, the moth infested area can be greatly reduced next year.

MR. SANDERSON: I have always felt that we did not have sufficient information concerning the methods of the spread of the gypsy moth. We know that the brown-tail moth has spread in a northerly direction, and this has been presumably due to the fact that the prevailing wind is in this direction during the period when the heaviest flight of the moths takes place. The spread of the gypsy moth has been in a northerly direction, and it seems to me that this matter is of sufficient importance to the whole country so that it should be thoroly investigated. It is quite possible that the young larvæ-bearing ærostatic hairs may be carried by the wind.

PRESIDENT BRITTON: We will now call on Mr. Rogers, who has charge of the gypsy moth field work in the United States Department of Agriculture.

MR. ROGERS: Since Mr. Headlee spoke about the bomb, I would like to say a few words in regard to it. We have large tracts of woodland which are inaccessible to spraying machines carrying water.

Mr. Fiske asked me to show this device in the exhibition room for distributing dry arsenate of lead over the trees while they are wet with dew, or after a shower. We have met with no marked success in its use, and it is shown only as a novelty, hoping that it might interest some of you.

The government moth work is conducted in coöperation with the officials of the different infested states. We have now over four hundred men at work in the field, clearing roadsides of underbrush, destroying the eggs of the gypsy moth, and cutting clusters of the brown-tails.

We have about one hundred men doing scouting work and about thirty in Maine, with a crew of twenty or more in Rhode Island.

I would like to mention a device which we have used with considerable success in spraying, which we have termed a water-tower. It is a long piece of steel tubing hung by a universal joint from the top of a short mast; the hose from the pump being attached to the lower end. The operator stands on the top of the tank and uses the part of the tube below the mast as a handle for swinging the nozzle about over the trees. The nozzle is about twenty-five feet above the ground, so that we can cover the top of trees one hundred feet high without climbing.

Mr. Worthley of the state office is making some experiments with a new nozzle, which I think, if explained, would benefit all of us.

PRESIDENT BRITTON: We would like to hear from Mr. Worthley before closing this discussion on the gypsy moth work.

MR. WORTHLEY: Mr. President, I think this subject has been very fully covered this afternoon, but I would like to mention the fact that the state of Massachusetts is exerting itself to the utmost in its warfare against the gypsy moth. We have carried on the campaign over a large area of country, and the residential sections which were infested are now in a very good condition. The woodland problem is the most difficult one to handle. The work is being pushed as vigorously as possible.

Mention has been made of the new nozzle which has been devised for the spraying of trees. This will be exhibited before the meeting closes, and a demonstration of its work will be made. By using this

device, it is possible for sufficient pressure to be maintained to spray trees seventy to eighty feet high without climbing them.

I trust as many of the members as possible will examine these spraying devices, which are being used in this section, and we should certainly be glad to receive any suggestions looking toward their further improvement.

PRESIDENT BRITTON: The next paper will be presented by Prof. H. A. Surface, Harrisburg, Pa.

SOME NEW FACTS IN REGARD TO LIME-SULFUR SOLUTION

By H. A. SURFACE, *Harrisburg, Pa.*

[Withdrawn for publication elsewhere.]

PRESIDENT BRITTON: We will now hear Mr. F. B. Lowe, Detroit, Mich., who will present a paper entitled "Studies in Insecticides."

STUDIES IN INSECTICIDES

By F. B. LOWE, *Detroit, Mich.*

[Paper not received in time for incorporation in the proceedings.—ED.]

PRESIDENT BRITTON: The next paper on the program will be by Mr. W. E. Hinds, Auburn, Ala.

CARBON DI-SULFID FUMIGATON FOR THE RICE WEEVIL IN CORN

By W. E. HINDS AND W. F. TURNER

At the meeting of the Association of Economic Entomologists held in Baltimore one year ago, announcement was made of a project for the investigation of the use of carbon di-sulfid as a fumigant. An outline of this project was given, and also, in a separate paper entitled "Carbon Di-Sulfid Fumigation for Grain Infesting Insects," a brief statement was made as to results obtained up to that time. The work of this investigation has been continued during the past year with a gradual increase in the scale of the experimental work as the results obtained have seemed to demand and warrant.

In addition to the project upon fumigation, another project for the investigation of the life history, economic relationships and injury of the rice weevil (*Calandra oryza* L.) has been approved for the Alabama station. The imperative need for work along the lines contemplated in each of these projects has been frequently emphasized dur-

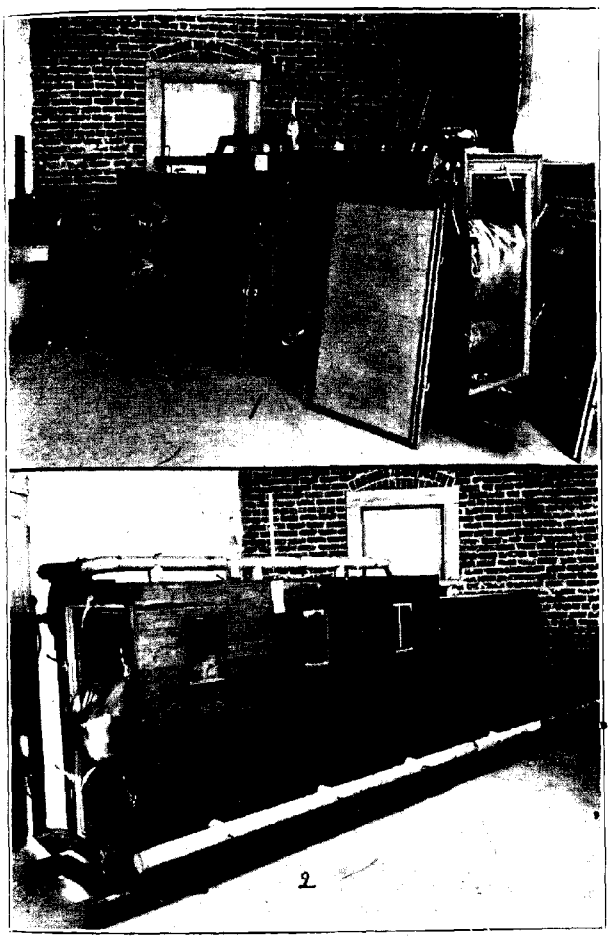
ing the past year by a large number of inquiries as to methods of exterminating insects in stored grain. There is no question but that the rice weevil is at present the most seriously injurious species of insect occurring in Alabama, and agricultural conditions at the present time indicate that the importance of its control will be greatly increased in the near future. During the past one or two years, there has been a general movement through the Southern States to increase the cultivation of corn. One of the most potent factors in this campaign has been the continued spread of the Mexican cotton boll weevil. The demonstration farm agents, under the direction of Dr. S. A. Knapp, have largely extended their work. State departments of agriculture have conducted campaigns through the offering of large cash prizes for the best yields of corn per acre, and many corn clubs, as they are called, have been formed. As a result of these and other educational influences, there has been during the past year more attention given to corn culture in the Southern Gulf States than was ever previously given to that subject. Crops of from 100 to 150 bushels per acre have been raised in many cases. Boys, who have entered the competition in the corn clubs have, as a rule, secured better yields than did their fathers; the demonstration farms generally yield crops of from two to three times the average in their localities. But possibly one of the most potent factors in the new effort to raise more corn has been the high price which corn has commanded during the past year. Planters who have raised only cotton, and depended upon buying what corn they might need, have been obliged to pay from 75 cents to $1.25 per bushel for corn. A large proportion of this corn has been shipped into Alabama from other states. Planters have come to realize that they cannot profitably produce cotton alone and buy corn at $1.00 or more per bushel with which to feed their working stock, nor can they afford to raise hogs and feed them upon corn, for which they must pay such prices, and they have become convinced also that the South is capable of producing practically as large corn yields as those obtained in what are known as the corn producing states.

During 1908 the corn yield of Alabama was estimated by the best authorities at approximately forty-four million bushels, having a cash value of about $37,000,000, or about 84 cents per bushel. The yield for 1909 will, in all probability, prove to have been even greater than that of 1908 and of higher average market value.

The large percentage of injury to corn held through the winter has been one of the factors in keeping many planters from raising more corn. While the injury is liable to vary from year to year, it is fre-

RICE WEEVIL INJURY TO CORN GERMINATION

Fig. 1. A. Evidently sound corn: Germination perfect, growth normal. B. Evidently slightly infested kernels but germ apparently sound: Germination 20%, only 10% of normal growth. C. Kernels showing weevil emergence holes, germs [illegible]. No germination.



FUMIGATION BOXES

Fig. 1. Three sections open and doors removed after gas had been driven out. Inlet line of ventilation pipe along top.

Fig. 2. Rear view of boxes. Outlet ventilating pipes at bottom leading out of window. Windows in box for watching temperature fluctuations, insect behaviour, etc. (Original.)

quently sufficient to destroy a large percentage of the feeding value of the corn before the middle of the winter. In some localities, particularly where the land is overflowed during the winter, it appears that the corn is but little affected, while upon uplands especially, ears sometimes contain a hundred or more adult weevils before the first of November. Badly infested corn is almost worthless, since it is not attractive even to hogs. Horses and mules frequently refuse it entirely.

Besides their effect upon the feeding value, the weevils injure very materially the value of the seed for planting. Kernels from which weevils have emerged will rarely germinate at all, and if they start to grow the plant is weak and backward. In the experiments to test this effect, sound kernels were placed in germination boxes in comparison with an equal number which showed but slight traces of weevil injury and also with another lot of kernels from which weevils had emerged. The germination from sound seed was perfect and the growth of the plants vigorous. The slightly injured lot gave 20 per cent germination, but only 10 per cent yielded plants of normal strength. The badly infested lot did not sprout (Pl. 4, fig. 1).

In another series of tests, corn was selected which showed an amount of weevil injury which was considered as a fair average for the condition of corn used for planting at planting time. One hundred kernels taken as the average ran on one side of the middle of an ear, gave 80 per cent germination with about 65 per cent of normal growth. One hundred sound kernels selected from the opposite side of the same ear gave 100 per cent of germination with normal growth (Pl. 4, fig. 2).

The results of these and numerous other germination tests show that weevil injury is in all probability responsible to a considerable extent for irregular stand and lack of uniformly normal growth in the corn fields of the badly infested area. Evidently this is quite an important factor in keeping down the average production of corn to the low yield of about 13 bushels per acre which has hitherto been obtained.

Among the species of insects which injure corn, the boll worm or corn ear worm (*Heliothis obsoleta* Fab.) is the first of importance in the time of its attack. Besides the injury which these worms do directly, it is evident that they prepare the way for increased injury by other species, which later attack the grain. A considerable degree of injury is inflicted by some of the grain moths, both before and after the corn is harvested, but the principal injury after harvesting is attributable to various species of Coleoptera, among which we have found the following particularly abundant: *Calandra oryza, Cathartus gemellatus, Cathartus advena, Silvanus surinamensis, Tribolium fer-*

rugineum and *Tenebrioides mauritanicus*. In the course of observations upon the rice weevil, records are kept relating to each of these other species. It appears that any treatment which insured the destruction of all emerged adults of the rice weevil, was very likely also to destroy the unemerged stages, with the possible exception of the egg, which we have not found in sufficient abundance to enable us to test its resistance satisfactorily. The experiments made thus far indicate that there is a wide working margin between the treatment necessary to destroy infesting insects and that which will endanger the vitality of the infested seed. It is now certain that no single dosage can be safely recommended for all conditions and subjects in this grain fumigation work. The percentage of moisture content in seeds is important as affecting their degree of resistance to the gas. It is also certain that the temperature prevailing at the time treatment is made has a great deal to do with the effectiveness of a given dosage. Thus, a dosage which will kill all stages of the rice weevil at 67 to 70 degrees F. is not likely to kill more than 60 or 70 per cent at 60 to 65 degrees F. The influence of temperature must certainly be considered as twofold. First, upon the evaporation of the liquid and the diffusion of the gas, and, secondly, upon the condition of activity or inactivity of the treated insects. It appears that with the high temperatures, when the weevils are most active, a far smaller dose of the insecticide is needed to destroy them and the killing time is really much shorter than when the temperature is below 65 degrees. It seems quite probable that this effect of temperature may partly explain the widely varying results which have been reported in the use of carbon di-sulfid.

According to the chemists, the specific gravity of carbon di-sulfid liquid is 1.29, while the vapor is 2.63 times as heavy as air. One volume of the liquid is said to yield 375 volumes of the vapor. Seventy-seven and six-tenths pounds of the liquid is required to saturate 1,000 cubic feet of air at the temperature of 68 degrees, and 84.4 pounds at a temperature of 72 degrees. It is evident, therefore, that in the usual application but a small fraction of the saturated atmosphere has been used.

In our experimental work, we began with small scale tests, using glass bell jars of two litres capacity, in which the proportion of gas could be controlled and its loss by diffusion entirely prevented. A satisfactory method of obtaining any desired dilution of the gas is as follows: Through a stopper in the bell jar or bottle, two tubes may be passed, both of which should be tightly closable from the outside in some way. One tube should reach to the bottom of the jar, while the

other merely passes through the stopper. A similar arrangement is provided for another bottle containing the carbon di-sulfid liquid. On one of the two lines connecting the bell jar and the liquid receptacle, a rubber bulb is inserted, which should be provided with valves so that all air passing through it will be propelled in one direction. By working this bulb a few minutes with the valves open, a saturated atmosphere may be easily obtained at any temperature and the amount of liquid per thousand cubic feet determined if desired. The valves may then be closed and connection made with another bell jar of similar size, and so that in a similar manner the atmosphere charged with bi-sulfid may be divided between the two jars. This gives an atmosphere of one-half saturation, and further division may be made in this manner. Working in this general way, it has been determined that one fourth or one eighth of a saturated atmosphere may be very nearly as quickly effective in destroying weevils as is the full strength, but in either case the question of temperature seems to be equally important. In any case, it is certain that the killing strength of the gas for the rice weevil must be maintained for at least one hour. If further dilution is used, the length of the exposure must be increased to secure death.

In order to test the effect of various strengths of treatment upon a larger scale, we have constructed a fumigation box to facilitate the work. One of these boxes is so arranged that 25, 50 or 75 cubic feet capacity may be utilized. The boxes are so made as to be practically gas-tight, and the doors fitted with double bearings which are thoroughly felted. The doors are entirely removable and fastened in place by six refrigerator bars each. The liquid di-sulfid is introduced through the top of the box by a graduated burette, the dosage quantities being determined in cubic centimeters instead of fractions of an ounce. Arrangement is made for ventilation by a line of three-inch piping connected with a blacksmith's forge fan, and with similar exit pipes through which the gas from any section of the box may be quickly driven out of doors upon the conclusion of the experiment. The openings to these pipes are tightly closed by conical plugs covered with felt. The appearance of the boxes and the method of their use is shown in the accompanying illustrations (Pl. 5, figs. 3, 4). These fumigation boxes have greatly facilitated the application in various tests, but the amount of labor involved in determining the effect, particularly upon immature stages, has been very great.

As indicating the nature of the results obtained in this work, the following table has been prepared:

FUMIGATION IN BOX

Date.	No. of sect.	Temperature.	Lbs. per 1,000 cu. ft.	Duration of exposure.	Effect on insects.							
					Calandra.		Cathartus.		Tribolium.		Tenebrioides.	
					Total stages.	% dead.	Total stages.	% dead.	Total stages.	% dead.	Total stages.	% dead.
Dec. 6....	I	60° F.	20	22 hrs.	246	100%	16	100%	8	100%	8	100%
Dec. 6....	IV	60° F.	20	5 hrs.	265	100%	58	100%	7	100%	3	100%
Dec. 7....	IV	52° F.	15	16½ hrs.	277	100%	24	100%	19	100%	4	100%
Dec. 13....	III	59°-45° F.	12½	20 hrs.	154	100%	75	100%	3	100%	4	100%
Dec. 13....	IV	59°-45° F.	12½	16 hrs.	151	100%	6	100%	....	.....	2	100%
Dec. 13....	II	58°-49°-60° F.	10	24 hrs.	141	100%	72	100%	.....	.....	5	100%
Dec. 9....	I	45° F.	10	4 hrs.	108	54%	12	16%	.....	.....	1	0%
Dec. 18....	I	60° F.	7½	24 hrs.	138	100%	87	100%	.....	.....	.....	.....
Dec. 9....	IV	47° F.	7½	4 hrs.	213	7%	30	0%	3	0%	.....	.....
Dec. 16....	II	46° F.	5	20 hrs.	149	95%	37	100%	.....	.....	.....	.....
Oct. 28....	IV	....	5	15 hrs.	100% all stages dead.							
Nov. 18....	III	....	4	16 hrs.	570	87%	14	100%	23	74%	21	48%
Nov. 18....	II	....	3	24 hrs.	535	83%	15	60%	2	50%	21	24%
Nov. 18....	I	.....	2	85 hrs.	470	79.5%	52	98%	24	100%	14	36%

So far as Calandra was concerned, the results from a treatment at the rate of 3 pounds for 24 hours was the same as with 4 pounds for 16 hours, 83 per cent being killed in each case. In some experiments, 5 pounds was completely effective in 15 hours, while in others only 95 per cent were killed in 20 hours, and the difference seems due entirely to the difference in temperature. Seven and one half pounds at 47 degrees killed 93 per cent in 4 hours and 100 per cent in 24 hours at 60 degrees. Ten pounds was completely effective in 24 hours for all weevils at 60 degrees, as was also 12½ pounds in 20 hours and in 16 hours at the same temperature. Fifteen pounds was completely effective in 16 hours at 52 degrees, as was also 20 pounds in 5 hours at 60 degrees. Further experiments are being made to determine these limits.

Taking up next the work done on a larger scale, we may mention two series of experiments performed at Montgomery, Ala., during the past fall. At one place, some 2,500 to 3,000 bushels of corn were stored in two exceptionally tight buildings constructed for that purpose. The walls and floors of these buildings are of cement and are built solidly to a height of about nine feet above the ground, with the floors slightly lower. Wooden partitions made of flooring divided the buildings into several rooms. The partitions were not at all tight, but the walls up to the eaves were unusually so. Corn was stored in several of these rooms about the first of September. It then contained many weevils, as the infestation during the present season is unusually severe. About two weeks after this corn was stored, the owner applied 20 pounds of commercial bi-sulfid, using about 10 pounds of it in the largest of the cribs, which contained approximately 2,000 cubic feet. The single door was closed, but not so as to fit tightly, and large cracks existed between the roof and the wall at the eaves. This room, therefore, received an application of about 5 pounds per 1,000 cubic feet, and the prevailing air temperature in the vicinity at this time was about 80 degrees (70–91 degrees) for three days. The smaller bins received from 2½ to 3 pounds per 1,000 cubic feet. Examinations of this corn were made about three weeks after the treatment and showed considerable numbers of living weevils, especially near the doors. It appeared that there was still sufficient infestation to warrant further treatment under such unusually tight crib conditions. Even at that time it was evident that the treatment in the larger bin with 5 pounds per 1,000 cubic feet had been quite fairly effective and more so than were the other treatments in the smaller bins.

In preparation for the second treatment, a thorough examination

was made of sample lots of corn taken from near the top, at about the middle and at between one and two feet from the bottom of each bin. Corn in these cribs averaged between seven and eight feet in depth and was all stored with the shuck on. The examination showed that in the large crib an average of about 7 per cent of Calandra survived. In some of the cribs receiving the weaker treatment, there was an average of between 25 and 30 per cent of Calandra stages alive. The corn was leveled off in the cribs and covered with a special waterproof, and apparently gas-tight, tarpaulin in each crib before the di-sulfid was applied. A recording thermograph and hygrograph was placed near the middle of one mass of corn to give those records for a week following the application. When all preparations had been made, "Fuma" carbon di-sulfid was applied in various cribs at the rates of 3, 5, 6 and 8 pounds per 1,000 cubic feet. The liquid was poured directly on to the corn, the tarpaulins spread over it as quickly as possible, and the doors, which had been previously padded, were closed and nailed tightly. To insure still further tightness around the doors, papers were pasted over the entire door and frame to each crib. The only possible escape for the gas in these treatments would seem to have been around the edges of the room between the tarpaulin and the wall and upward and outward along the eaves. Subsequent examinations showed that the temperature at the time of beginning the experiment was between 57 and 58 degrees F., with the humidity averaging about 60 per cent. During the week after the treatment was made, both temperature and humidity arose steadily and gradually to a maximum of 63 degrees F., and 77 per cent humidity for the middle portion of this mass of corn. Under these conditions, a brief consideration of the results may be of interest. The examinations entailed a large amount of routine work, which could not be avoided on account of the necessity for determining the effect upon immature stages as well as upon adult insects. In the crib where but 7 per cent of Calandra stages were alive at the middle of October, there was about 32 per cent of living stages by the first of December in spite of the application of 8 pounds per 1,000 cubic feet. Similarly, in the other cribs. the percentage of living stages had largely increased before the examinations were completed. As a whole, it must be admitted that the treatments yielded very disappointing results, and in comparison with the fair degree of effectiveness of the treatment made at the middle of September, the principal varying factor which may offer a basis of explanation again seems to be the difference in temperature prevailing at the time the treatments were applied (57 vs. 80 degrees F.).

In another place where corn was stored, in one corner of a barn, the

cracks were battened with lathing nailed as tightly as possibly along them and partitions of matched boarding constructed so as to form three adjacent sections, each containing approximately 100 cubic feet. This corn had but recently been husked and placed in storage, and practically all weevil stages present were alive. Temperature and humidity records were kept here also. To add if possible to the tightness of the room, gas-tight tarpaulins were hung outside the walls, reaching from a height above the level of the corn to the ground. The corn was also covered with a similar tarpaulin. In this case Fuma di-sulfid was applied at the rates of 10, 15 and 20 pounds per 1,000 cubic feet. The temperature at the beginning of the treatment stood at 47 degrees F., but fell during the next two hours to 35 degrees.

During the succeeding thirty-six hours after this minimum was reached, it rose gradually and steadily to a maximum of 55 degrees, from which point it again fell to 35 degrees and subsequently two minimums of 32 degrees were reached with the maximum never exceeding 53 degrees. The unusually low temperature prevailing is doubtless sufficient explanation for the fact that in none of these sections was there more than 15 or 20 per cent mortality among the adult weevils, even where the largest dosage was applied. In conclusion, it would appear that the important results obtained from these experiments are as follows:

Grain infesting insects may be destroyed with carbon di-sulfid, cheaply and effectively, by even an application of 5 pounds per 1,000 cubic feet in exceptionally tight compartments, while the temperature is above 70 degrees F. It requires but a few hours to kill the weevils if a strength of gas equal to one quarter of a saturated atmosphere can be maintained, and provided the temperature is high enough to insure a considerable degree of vital activity on the part of the insects. Fumigation work with temperatures ranging below 60 degrees F. appears to be largely ineffective and inadvisable. Particularly in the Southern States, it would be possible to make the applications so that the temperature during the next few hours will average above 60–65 degrees. While the results obtained have been in some degree disappointing, we believe that they indicate a possible basis of explanation for variation in the effectiveness of treatments that have been reported in the past. They also show that the conditions under which each application is made constitute a problem by itself, and there is reason to feel that we may ultimately understand the influence of the many factors involved sufficiently well to enable us to adjust our methods of treatment so that they may produce more uniform and more satisfactory results. In spite of the many drawbacks to the common use of

carbon di-sulfid as a grain fumigant, we know of nothing equally effective which may be used any more satisfactorily. At the most, the expense of treatment will average less than a cent per bushel, and this is a very small cost to greatly lessen, if not entirely prevent, insect injury and the loss of from 25 to at least 65 per cent of the real value of corn, which must be stored for a period of several months in the Southern States.

MR. HEADLEE: I have taken great pleasure in listening to this paper, for it seems to me that Doctor Hinds has hit upon the proper method of investigating the effect of gases on this insect. He has taken into consideration the difference in temperature and has probably considered the effect of moisture. It seems to me that we are coming to a time when the measures for the control of injurious insects must not only be based on a fundamental knowledge of their life economy in relation to the environment in which they live, but the relation of the measures themselves to the environmental conditions under which they will be applied must be fundamentally investigated.

The work of which we have just heard is a long step in this direction. The fundamental investigation of the life economy and measures of controlling seriously injurious insects in relation to environmental conditions is one of the most promising lines open to the economic entomologist.

I noted a few points which I would like to ask about. Is the rice weevil the largest destroyer of corn in the South? I raise that point for the reason that in south Kansas the Angumois grain moth seems to do the most damage to stored corn. Doctor Hinds did not report on the effect of moisture, and I would like to know whether in his opinion it had any important part in his results.

MR. R. I. SMITH: There is one thing, I think, Professor Hinds would have explained, if he had taken time. He said that in one experiment he found nearly 7 per cent of the weevil stages alive, and that the same grain, after receiving a second treatment in October, a month or six weeks later, with a greater strength, showed 38 per cent of the weevil stages alive. Of course, that seems very contradictory and inexplicable, but as I made some tests along this line last year I would say that the weevils which remained alive after the first treatment in September would account for the increase. They certainly do multiply rapidly.

I would like to ask in what way he determined the percentage of live weevils which has been shown in the results.

MR. HINDS: In most cases a period of at least a week elapsed be-

veen treatment and the time the examinations were made. It is a ry slow process to make the necessary counts.

In regard to moisture, I consider that we have more to investigate this direction, but we have not found as yet that moisture has anywhere near the same importance as temperature.

MR. R. I. SMITH: The results of Professor Hinds' experiments would indicate that the fumigation with carbon bi-sulphide in the case cited was not successful. The corn only slightly infested with weevils in September showed after a second treatment in October 38 per cent of weevil stages alive. Most farmers think that the fumigation is worthless unless they secure better results than this. In case a fumigation kills 90 or 95 per cent of the weevils, and then two months later the few remaining alive increase to considerable numbers, it gives the farmers the impression that the treatment was worthless.

My reason for making this statement is not to reflect on Professor Hinds' statement, but simply to explain the farmers' point of view.

PRESIDENT BRITTON: We will now hear a paper by Prof. R. A. Cooley, Bozeman, Mont., on "Notes on the Oyster Shell Scale in Montana."

NOTES ON SPRAYING EXPERIMENTS FOR THE OYSTER SHELL SCALE IN MONTANA

By R. A. COOLEY, *Montana Agricultural Experiment Station*

During the past ten years the oyster shell scale (*Lepidosaphes ulmi* L.) has been gradually increasing in the apple orchards in the river valleys in the western part of Montana. By the year 1907 it had come to be regarded by the apple growers as rather a serious pest and, perhaps a menace to the orchard industry in the Bitter Root valley and around Flathead lake. In some orchards, particularly in those that have been more or less neglected, the scales now occur in notable numbers, encrusting the limbs and branches almost completely, and even extending down on to the main trunk, where great numbers become fastened under the loose scales of bark. Much fruit has been blemished and rendered unsalable by the insects attaching to it, and the stems of the apples are often more or less completely covered.

We have repeatedly recommended the use of kerosene emulsion, applied as a spray at the time of hatching, but growers have reported that no success followed the treatment. We also recommended lime-sulfur solution as a winter treatment.

Several years ago, in 1903, on April 21 and 22, lots of seven to nine apple trees in the orchard of Mr. Delaney, at Lo Lo, Montana, were

sprayed with different lime-sulfur solutions. Two subsequent visits were made to the orchard, one before the hatching of the eggs and one after, and we were unable to detect that any good had been done.

During the past three years we have received several reports from practical fruit growers that attempts to kill the scale by winter applications of lime-sulfur solution have not been successful. However, we also have received reports of success.

It was, therefore, apparent that an investigation and spraying tests were necessary. Accordingly a series of tests was arranged and carried out in 1909. The orchard that was selected for the experiments is located at Lo Lo and owned by Mr. Fred Gilbert. It is in sod, composed of old trees, and with a number of varieties. The trees had been cut back and pruned, and as the scale was abundant and fairly evenly distributed, the orchard was quite satisfactory for our purposes.

In spraying the trees we desired not only to find an insecticide that would kill and be generally satisfactory, but also to discover just how and when the insects or the eggs were killed. We hoped to find an explanation for the apparent lack of uniformity of results with the use of the lime-sulfur solutions, and remedies for use before the opening of the buds as well as after the hatching of the eggs in June. We therefore conducted a part of our tests on April 17 and 19, before the leaf buds had opened, and then waited for the appearance of the young. Hatching began on June 10, was well under way by June 14, and practically completed by June 20. The spraying for the hatched insects was divided into two series, the first being applied in the early part of the hatching period and the second in the latter part, for we desired to know whether the summer treatment, to be successful, should be applied at any particular time during the hatching period. Certain lots of trees were therefore sprayed on June 14 to 17, and others on June 21 to 23.

For convenience the various tests are here tabulated, with the results, as follows:

I

First series applied before hatching and before the buds had opened, and intended to kill the insect in the egg stage. Spraying done April 17–19.

1. Linseed oil emulsion, one gallon to nine of water.

Raw linseed oil	1 gal.
Hard soap	½ lb.
Water to make	10 gal.

The emulsion was made as with kerosene emulsion, excepting that a ..rger volume of hot water was used. The churning was done with ..e power sprayer by shutting the valve into the supply pipe and ..cing the mixture through the overflow pipe back into the supply ..nk. A violent churning was so produced.

Several microscopical examinations made up to the time of hatching showed no apparent results. Examinations made while hatching was under way showed that many eggs had turned light brown and were shriveled and stuck one upon another and upon the bark and sides of the parent scale. Living larvæ could be seen vainly attempting to extricate themselves from the adhering mass of eggs. Practically no young attached to the bark and formed scales. Subsequent examinations showed that the treatment had been very effective. No injury was done to the trees.

2. Undiluted kerosene.

Designed to test the ultimate killing power of kerosene and not thought of as a practical remedy.

A considerable number of scales were loosened and dropped to the ground—probably about one third—but the eggs under those left on the tree hatched and the young developed normally. The trees were late in putting out foliage and were injured.

3. "Rex" lime-sulfur solution, one part to six of water.

Repeated microscopic examinations made up to the time of hatching showed no visible effects on the eggs. Moreover, the eggs hatched in a normal manner, and the empty egg shells could be found under the old scales later in the summer, but very few of the young ver attached to the bark, or, if they did attach, they soon loosened nd dropped. The treatment was, therefore, effective and satisactory.

We were able to find practically no difference in the results obained from the use of "Rex," "Niagara" and home-made limeulfur solutions, nor were the greater strengths more effective. All howed good and satisfactory results.

4. "Rex" lime-sulfur solution, one part to eight of water. See esults under No. 3.

5. "Rex" lime-sulfur solution, one part to ten of water. See results under No. 3.

6. "Rex" lime-sulfur solution, one to six, with three pounds lye

added to 50 gallons of the mixture. See results under No. 3. No advantage was detected from the use of lye.

7. "Niagara" lime-sulfur solution, one part to six of water. See results under No. 3.

8. Home-made lime-sulfur solution. See results under No. 3.

Lime	1 lb.
Sulfur	1 lb.
Water	2 gal.

9. Home-made lime-sulfur solution. See results under No. 3.

Lime	1 lb.
Sulfur	1 lb.
Water	3 gal.

10. Lye solution. Very little benefit was derived from this treatment.

Lye	1 lb.
Water	3 gal.

11. Lye-sulfur solution. Prepared as with lime-sulfur solution; cooked until the sulfur was all dissolved. The results were not convincing; some good was done.

Lye	1 lb.
Sulfur	1½ lb.
Water	3 gal.

12. Pratt's "Scalecide," one part to ten of water.

Before hatching time the eggs showed an oily appearance but hatched normally. Some scales were loosened and dropped off, though a smaller proportion than with undiluted kerosene, as reported under No. 2. Not a satisfactory treatment.

13. Whale-oil soap solution, one pound to one gallon of water, applied hot. Apparently this treatment had no effect.

II

Second series applied early in hatching period. Desired to be effective in killing young that had hatched and those about to hatch. June 14–17.

14. Pratt's "Scalecide," at rate of one to fifty.

A small percentage of the young lice were killed. Not a satisfac-

y treatment. Very distinct, though not extensive injury to the ;age.

15. Pratt's "Scalecide" at rate of one to seventy-five. Same re-..ts as with No. 14, but with less injury to the foliage.

16. Linseed oil emulsion, prepared as for test No. 1.

Raw linseed oil	1 gal.
Hard soap	1 lb.
Water to make	12 gal.

Practically all the lice were killed, and the treatment was considered very satisfactory. This and the cottonseed oil emulsion treatments were considered to be the most satisfactory for summer use. The trees were not injured.

In connection with judging the results of this treatment we should mention that the Board of Horticulture sprayed a neighboring orchard with linseed oil emulsion, independent of the writer's experiments, on June 24 and 25. The scales were all killed and a small amount of injury was done to the foliage. Other trees were sprayed by the board with cottonseed oil emulsion, resulting in a killing of all the young scales, with less injury to the foliage.

17. Cottonseed oil emulsion. Prepared as with linseed oil emulsion.

Cotton seed oil	1 gal.
Hard soap	1 lb.
Water to make	12 gal.

Results were practically the same as with linseed oil emulsion summer spray. No injury to foliage.

18. Kerosene emulsion, one part stock emulsion to twelve of water. Very few, if any, of the scales were killed.

19. Whale-oil soap solution at rate of one pound to eight gallons of water, applied warm. A few, possibly 10 to 15 per cent, were killed.

20. "Rex" lime-sulfur solution, one part to fifteen of water. The treatment was unsatisfactory, very few young being killed.

21. "Self-boiled" lime-sulfur solution. Practically no good was done.

Lime	15 lbs.
Sulfur	10 lbs.
Water	50 gal.

22. "Blackleaf" tobacco extract, one part to fifty of water. We were surprised to find that this treatment was of very little benefit.

23. "Orwood" tree spray, one part to twelve of water. Apparently useless for this purpose.

III

Third series, applied late in hatching period. Desired to be effective in killing all the living young. Sprayed June 21 to 23.

24. Pratt's "Scalecide," one to fifty, using same trees as test No. 14.

This treatment did very little good. A high percentage of scales developed on trees sprayed twice during hatching time.

25. Pratt's "Scalecide," one to seventy-five, using same trees as test No. 15. Results same as under No. 24.

26. Linseed oil emulsion, using one gallon raw oil to fifteen gallons water. Seven out of the nine trees used in test No. 16 were used.

Probably no good was done by the second spraying during the hatching period, as the two trees left untreated under this number showed practically the same results as under No. 16.

27. Cottonseed oil emulsion. Repetition of treatment on trees used in test No. 17.

It is not clear whether this second treatment was beneficial, as, through an error, no trees were left unsprayed, as under No. 26.

28. Kerosene emulsion, one part of stock emulsion to twelve of water. Same trees used as in test No. 18. Very few, if any, were killed.

29. "Rex" lime-sulfur solution, one part to fifteen of water. Same trees used as in test No. 20. There was practically no benefit from this treatment.

30. "Blackleaf" tobacco extract, one part to fifty of water. Same trees used as in test No. 22. Practically no good was accomplished with this treatment, as with No. 22.

31. Linseed oil emulsion, one part to fifteen parts of water. A fresh lot of trees was used in this test.

The results under this number are doubtful, as it was later learned that the trees, which were in another orchard, had been sprayed in the spring with another insecticide.

In all of these tests a small power sprayer owned by the Montana State Board of Horticulture was used. A representative of the board, under the pay of the board, did the actual spraying, under my direction. The board also furnished practically all the material and supplies used in these experiments. It gives me pleasure to express my appreciation of the assistance and courtesy extended by the Board of Horticulture, through Mr. M. L. Dean, state horticultural inspector.

In conducting the work twelve trips to the Bitter Root valley were made, as follows: March 25–28, April 17–19, April 24–25, May 6–8, May 18–21, May 31–June 1, June 10, June 14–17, June 21–23, July 12–16. August 26–27, October 4–7.

Even under ideal conditions in orchards selected for such tests, it would be impossible to make entirely reliable statements concerning the comparative benefits following different treatments. We found that certain of the oily insecticides, applied before hatching of the eggs, caused a part of the scales to drop off, but it was impossible to determine what proportion had dropped. It would have been of some value if we had given the various trees a rating designed to indicate the comparative degree of infestation before the treatment, although on trees of which we made microscopical examinations and counts such a rating would have been of but little value, for the examinations were made on small twigs, which naturally would not conform closely to a tree rating. In examining the scales on the twigs we found a Zeiss binocular microscope of great service. Besides using it as a dissecting microscope we took off the lenses, with the mountings, and used the detached part in the hand, as with a field binocular.

The apparently conflicting results following the use of lime-sulfur solutions for this insect while the trees are dormant are striking. It is possible that differing weather conditions may explain the killing at one time and failure to kill at another. It is well understood that the sulfur compounds deposited upon the trees by the spray are acted upon chemically by the carbon dioxide of the air, resulting in the liberation of the gaseous sulfureted hydrogen and leaving on the tree pulverulent deposits of finely divided free sulfur and calcium carbonate. It has been shown on a previous page that this insect is killed by the winter application of lime-sulfur solutions only after the eggs hatch. It seems clear that the actual agent in the killing of the young, tender lice is the free sulfur resulting from the decomposition of the sulfur compounds. This decomposition has all taken place long before the hatching of the eggs. Therefore it seems possible that con-

tinued rain storms may so reduce the amount of free sulfur on the bark as to render the treatment harmless to the insects.

Further work on the subject will be done in the season of 1910.

From the foregoing two interesting points are apparent:

(a) Eggs of the oyster shell scale are unaffected by the application of lime-sulfur solutions made previous to the opening of the buds. On trees so sprayed the young were killed very soon after hatching. The intervention of rain storms before the hatching of the eggs may more or less affect the value of the treatment.

(b) It is indicated that emulsions of linseed oil and cottonseed oil may be useful for the treatment of this insect while in the egg stage and during the hatching period.

MR. BRAUCHER: Some years ago I was engaged in spraying work in Lincoln Park, Chicago, and secured practically the same results that Professor Cooley has indicated. The eggs of the insect in many cases appear to be perfectly normal up to the time of hatching, but in most cases the young failed to establish themselves, and later in the season I was unable to find living insects on the trees.

The home-boiled lime-sulfur wash was used, being applied from November until early spring, and gave satisfactory results.

MR. SURFACE: I have found several cases in Pennsylvania where this insect has been practically exterminated by using the lime-sulfur wash. This was used in the orchard of Mr. Robert Beaston, at Tyrone, Pa., with excellent results.

[The Proceedings will be continued in the next issue.—ED.]

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

In accordance with the provisions of the constitution, the President has appointed the following Committee on Membership for the year 1910: Prof. H. E. Summers, Prof. A. L. Quaintance and Dr. S. A. Forbes.

E. D. SANDERSON, President.
A. F. BURGESS, Secretary.

Proceedings of the Eighth Annual Meeting of Horticultural Inspectors

The eighth annual meeting of the Association of Horticultural Inspectors was held in the Copley Square Hotel, Boston, Mass., December 27th and 28th, 1909.

For convenience the business transacted at the meeting will be reported first, which will be followed by the papers and discussions.

PART I

The meeting was called to order by President F. L. Washburn at 2 p. m., Wednesday, December 27th, in the lecture hall at the Harvard Medical School. In the absence of Secretary T. B. Symons, the President appointed E. F. Hitchings of Maine to act as Secretary *pro tem.* A good attendance of members of the Association and visitors marked each session of the meeting. Among the Inspectors present during the meeting were:

F. L. Washburn, St. Anthony Park, Minn.; J. B. Smith, New Brunswick, N. J.; H. E. Summers, Ames, Iowa; G. G. Atwood, Albany, N. Y.; Franklin Sherman, Jr., Raleigh, N. C.; N. E. Shaw, Columbus, Ohio; H. A. Surface, Harrisburg, Pa.; E. B. Engle, Harrisburg, Pa.; J. L. Phillips, Blacksburg, Va.; E. L. Worsham, Atlanta, Ga.; P. J. Williams, Auburn, Ala.; L. R. Taft, East Lansing, Mich.; S. A. Forbes, Urbana, Ill.; A. E. Stene, Kingston, R. I.; J. E. Stewart, Morgantown, W. Va.; W. E. Rumsey, Morgantown, W. Va.; C. P. Gillette, Fort Collins, Col.; T. J. Headlee, Manhattan, Kan.; S. J. Hunter, Lawrence, Kan.; E. F. Hitchings, Augusta, Me.; L. M. Peairs, College Park, Md.; E. D. Sanderson, Durham, N. H.; W. A. Thomas, Clemson College, S. C.; W. E. Britton, New Haven, Conn., and P. L. Huested, Albany, N. Y.

The American Association of Nurserymen was represented by Messrs. William Pitkin and Irving Rouse of Rochester, N. Y.

In opening the meeting, President Washburn reviewed the work of the Association and pointed out the need of more thorough organization and the desire of the inspectors that the proceedings of the meeting be printed.

These subjects were discussed by the members; the matter of having a stenographic report of the meeting and proceedings printed was referred to the following committee:

W. E. Britton, Chairman; C. P. Gillette and H. E. Summers, which committee later reported as follows:

REPORT OF COMMITTEE ON PUBLISHING PROCEEDINGS

Your committee recommends that the Association hereafter employ a stenographer to report the proceedings of the annual meeting, and these proceedings, after being edited by the outgoing Secretary, shall be printed and distributed to members of the Association. The expense incurred for such stenographic service, printing, etc., shall be met by an assessment levied pro rata on each state, territory or Dominion of Canada, represented or desiring representation in the Association: provided that by reason of the law of such state or territory the ruling of boards of audit prevents their paying the assessment due, such deficit shall be apportioned pro rata among the other states, territories and Dominion of Canada. The failure of any state or territory to be able to share its burden of expense shall not prevent its representatives participating in the meeting.

W. E. BRITTON,
H. E. SUMMERS,
C. P. GILLETTE,
Committee.

Question No. 19 on the program, in regard to the desirability of having a more regular organization, was fully discussed and referred to the following committee to report at the next annual meeting:

Committee on Organization: Messrs. G. G. Atwood, S. J. Hunter, H. A. Surface, W. E. Rumsey and T. J. Headlee.

Mr. A. F. Burgess read a letter from the United States Consul at Belgium in regard to the certification of imported nursery stock from that country. The letter was referred to a committee, composed of J. B. Smith, chairman; G. G. Atwod, S. A. Forbes, which committee reported as follows:

REPORT OF COMMITTEE

Your Committee on the Advisability of Securing Consular Certification to Foreign Certificates reports that in its opinion this Association should favor any method that would tend to secure proper inspection or that would add to the value of certificates. It feels, however, that the value of a certificate depends primarily upon the standing and official position of the individual making the inspection, and that no consular certification can add to this value.

It recommends, therefore, that no action requiring consular certification to inspection certificates be taken.

J. B. SMITH.
G. G. ATWOOD.
S. A. FORBES,
Committee.

The report of the Committee on General Principles governing the Association was submitted by Chairman J. B. Smith.

After considerable discussion, the following was adopted by the Association:

REPORT OF THE COMMITTEE ON GENERAL PRINCIPLES GOVERNING THE ASSOCIATION

1. The first and principal duty of the horticultural inspector is to his constituents, the farmers and fruit growers of his state.

2. Inspection, quarantine and similar laws are passed for the protection of these interests, and so far as the inspector is charged with the enforcement of the laws he must keep in mind always their purpose, no matter what the effect may be on other interests.

3. The inspector owes the nurserymen whose stock he inspects fair treatment and all the consideration that the law allows him to accord, but nothing else.

4. The inspection laws, although meant primarily to protect the horticultural and agricultural interests, are not intended to injure the nursery interests, and they should never be made to bear any more severely upon growers of stock than is absolutely necessary.

5. Between the honest nurseryman and the inspector there should be cooperation and an attitude of helpful interest on the part of the former.

6. The dishonest nurseryman, or one who wishes to dispose of questionable stock to avoid loss, deserves no consideration whatever.

7. The Association of Horticultural Inspectors is a voluntary one, and its members are bound by none of the actions taken at the meetings except as they approve themselves to their judgment.

8. The relation between the members is that of colleagues or comrades engaged in efforts to the same end, under different conditions, seeking mutual help and information, by free conference at the meetings.

9. As colleagues, each member owes to every other member frankness, honesty and a belief that every man is doing the best he can under his circumstances, and that his certificates are honestly given, and state facts correctly.

10. Each member recognizes the possibility of error in his own work and in that of others, and recognizes also that the receipt of a parcel of infested stock bearing a certificate is not necessarily evidence of either carelessness or lack of proper system on the part of the inspector whose certificate is attached.

11. Each member, whenever he gets track of a parcel of infested stock bearing the certificate of a fellow member, owes it to that fellow member to notify him immediately of all the facts in the case, that an investigation may be made by the inspector concerned and a continued misuse of his certificate prevented.

12. Whenever any inspector has reason to believe that any nurseryman in his state is willing to run risks of shipping stock not suitable for interstate trade into another state, it is his duty to warn the inspectors of neighboring states into which he has reason to believe stock may be sent, that stock from such nursery is open to suspicion.

13. It is the duty of every member of this Association to answer frankly and freely every question asked by a fellow member concerning nurseries or other conditions in his state, and it is the duty of the member so informed to consider this information as confidential and not for publication.

14. In case at any time a certificate be withdrawn or a nurseryman hold-

ing a certificate be detected in dishonest or questionable practice, notice of such withdrawal shall be at once sent to every other inspector within the region where such nurseryman is known to trade, and notice of such dishonest or questionable practice shall be given to all inspectors in states likely to be affected by such practices.

15. In this Association the rule that should goven all members is, Do unto the others as you would that the others should do unto you.

JOHN B. SMITH,
H. T. FERNALD,
AVON NELSON,
FRANKLIN SHERMAN, JR.,
F. L. WASHBURN,
Committee.

The following resolution, offered by Mr. J. L. Phillips, was endorsed by the Association:

Resolved, That no certificate should be used on any nursery stock that is infested with San José scale, badly deformed by Wooly aphis or diseased with Crown gall.

In concluding the discussion of question three on the program, Mr. T. J. Headlee moved that a committee of three be appointed by the chairman to investigate the different means of treatment of infested nursery stock in different states, and to recommend to inspectors a tentative method of procedure by which infested nurseries are to be handled, also methods of treatment of imported nursery stock.

The chairman appointed Mr. Franklin Sherman, Jr., E. L. Worsham and J. L. Phillips.

The Committee on National Legislation, through Professor Sanderson, reported a proposed bill[1] which had been agreed upon at a conference with the representatives of the Nurserymen's Association and the chairman and some members of the Committee of the Pomological Society to consider this matter. The principles of the bill were endorsed by the Association, and it was moved and carried that the chairman appoint a committee to make such changes as may seem necessary; the committee to confer with the committees of American Nurserymen's Association and American Pomological Society, respectively, and make every effort to have the same passed by Congress.

The chairman appointed Messrs. T. B. Symons, E. L. Worsham and G. G. Atwood.

The selection of officers for the ensuing year resulted in the re-elec-

[1] A copy of the revised bill will be published in a subsequent issue of the JOURNAL.

tion of the present ones: F. L. Washburn, St. Anthony Park, Minn., President; T. B. Symons, College Park, Maryland, Secretary.

The following resolution offered by the Secretary was endorsed by the Association:

Resolved, That this Association hold at least three sessions at its annual meetings, such sessions to be arranged with as little interference with allied associations as possible.

There being no further business, the meeting adjourned.

Note: The Secretary desires to express his appreciation to Mr. E. F. Hitchings for his kindness in making notes of the meeting prior to his arrival.

PART II

President F. L. Washburn, in opening the session of the meeting Monday afternoon, made the following remarks:

THE WORK OF THE ASSOCIATION OF HORTICULTURAL INSPECTORS

By F. L. Washburn, *St. Anthony Park, Minn.*

Gentlemen: What I have to say is hardly to be dignified with the name of an address, but rather an appeal to the members of the Association to stand together as a unit in endeavoring to perfect inspection laws and other conditions of inspection which tend to promote the best interests of good horticulture in the United States.

You will join me, I am sure, in complimenting our Secretary upon his enthusiasm and upon the faithful discharge of his duties during the last year, and also upon his location, so near the center that it affords him additional advantages in forwarding the work.

The growth and importance of this work, the need of better organization and better financial facilities, is perhaps the most important question before us at this meeting.

An impetus to our work has arisen in the danger contained in imported stock, and the additional work put upon the inspectors in the various states on this account is no mean factor. When as inspector for Minnesota I was asked to look after this stock, I had no conception of the amount of foreign material shipped into my own state, and have been astonished at the enormous number of plants brought into Minnesota from Holland and France in some instances, like the box-elder, for instance, trees which are commonly raised in our state, but which nurserymen find it cheaper to buy in Holland than to raise

at home. The indifference of florists and nurserymen in connection with this necessary inspection of foreign stock is to be deplored, and there certainly is need of a clause in the law, if we have a Federal inspection law governing importations, obliging these parties in the interest of the welfare of horticulture, to notify their various inspectors of the arrival of foreign stock which has not previously been inspected in this country. While I believe we, as inspectors, are not at all unanimous in desiring uniform inspection laws throughout the country, nevertheless if it were possible to have Federal laws supporting this body in its resolutions, and its members in their work in their various states, I believe it would add dignity to the work and relieve us of much embarrassment. It is almost impossible, with the business interests in a state so antagonistic to progress along these lines, to pass state laws stringent enough to fit the needs of the situation.

Closely allied to the need of strengthening our work and our position in the various states is the demand for publishing the proceedings of our meetings. This calls for money; not much, however. At the suggestion of our Secretary I sent out circular letters to all of the inspectors, asking them if their departments or their various boards of control would countenance an annual assessment to this end, and it was with pleasure that I learned from many that they can promise this financial support. Almost all of them from whom I have heard say they are quite positive their various boards will allow it, and some give positive assurances to this end. I trust there are many here from whom I have not heard who are attending the meeting with the same favorable answer to the proposition.

There are various points in connection with the work upon which I feel keenly, and which I should like to discuss, but our program is a long one, and these various points I have in mind are either on the list of subjects for discussion, or will come up naturally in the remarks following the various papers to be presented.

Each and all of us come in contact more or less with the apathy or indifference on the part of nurserymen, until their business is affected. I venture to assert that if a copy of our program were sent by each one of you to each of your constituents, asking for some comment, or some suggestions to be presented to the meeting, that a very small fraction of your nurserymen would take the trouble to reply. Now, I believe if we had Federal authority behind us, not in the matter of uniform laws regarding fumigation and other details not demanded by every state, but uniform laws regulating our relations to the nurserymen, and the relations of the nurserymen to us, this evil in a measure would be corrected.

It is reported that the American Association for the Advancement of Science meets in Minneapolis in the winter of 1910, and I suppose that this Association will also meet there. If it is definitely decided that such be the case, you must remember that you are coming into a cold country, though a beautiful one, and I wish to assure you that although the temperature is low, the hearts of the people are warm, and we will do all we can to make you feel at home, and to repay you for the journey.

A discussion of the points suggested in these remarks is noted in Part I.

A paper was presented by Mr. G. G. Atwood.

BROWN-TAIL MOTH ON IMPORTED NURSERY STOCK

By G. G. Atwood, *Albany, N. Y.*

On the 1st of January, 1909, information came to the Department of Agriculture in Albany that brown-tail moths in the usual winter form of nests had been found in a recent importation of nursery stocks from France. The great importance of this discovery was at once appreciated by the Commissioner of Agriculture, who by statute is charged with the responsibility of preventing the introduction of "dangerously injurious insect pests" into the State of New York. We knew that extensive importations from France and other countries were due to arrive during the months of January, February and March, and furthermore that the millions of stocks and seedlings were for planting in nearly every nursery in the state. A circular of information calling attention to the conditions confronting us was distributed to all our nurserymen and planters and they were directed to notify the Department of the arrival of any importations of stock from abroad and requested to hold all boxes unopened until an inspector of the Horticultural Bureau could be present. Fortunately, we had for years previous a requirement of law by which transportation companies bringing nursery stock into the state must notify the Department of their having in their possession any such shipments and giving names and addresses of consignors and consignees, together with such other information as might be required. Special requests were at once made of the sixty odd transportation companies to heed the letter of the law.

We further asked and received the coöperation of Custom House brokers, securing from them much information, particularly in refer-

ence to boxes imported, names of consignees, number of boxes, name of transportation companies receiving the boxes, and dates.

By direction of the United States Secretary of the Treasury, Collectors of Customs in the eight ports of entry within the state were authorized to give our Department of Agriculture the information required to enable us to locate importations and their destination. By courtesy of the Naval Officer in New York City, where the bulk of importations were cleared, we were permitted to place an agent who copied such portions of every manifest for our use as needed.

The Department had a dozen trained inspectors available, to whom additional help was given as required. All were placed in sharp communication to facilitate inspections and avoid delay and exposure to seedlings.

Our inspectors were directed to locate and burn at once all nests of brown-tail moths found. No one was permitted to save, handle or give away any specimen nests. Boxes in which nests were actually found were at once burned, together with all moss, packing materials and linings. Subsequent examinations of all cellars and shops where imported stock was handled were made and all trimmings were carefully collected and burned. Early in the month of January we found that wherever infested stock was unpacked in a warm room the larvæ would leave their nests and not return as they do in the open. They would soon cover themselves with their silken threads wherever they found lodgment.

To discover and burn all nests required a very careful seedling to seedling inspection, especially with branched or bushy plants. Even the roots needed to be carefully examined for any nest or portion of nests that might have been torn off and dropped into them. The custom of packing seedlings not tied in bundles placed tops and roots in layers caused a distribution of nests through the boxes containing from 3,000 to 15,000 seedlings each. All such inspection was comparatively simple, until we learned the habits of the escaped caterpillars, after which an inch to inch inspection was pursued. At this stage, of course, careful fumigation of all stock with hydrocyanic acid gas appeared feasible, but to our disappointment we found that the use of a formula of four or five times such strength as is used for San José scale, with long time exposure, was ineffective. The young larvæ were not all killed. With more time and many more experiments we do not find yet that fumigation can be relied on. All stock from boxes in which nests were found were ordered dipped in miscible oil at portions of 1 of oil to 20 of water. This proved effective, and if a weaker mixture would accomplish the desired results we should like to know it.

In the mass of reported shipments that came to our office while we were receiving daily reports of the discovery of a large number of nests by our inspectors, we at the same time had knowledge of large shipments of imported stock to nearly every state in the Union and to the Dominion of Canada.

Certainly we could not permit the establishment of brown-tail to the southwest and north of us. Therefore, in accordance with the usual custom of the members of this Association—the American Association of Official Horticultural Inspectors—we sent a statement of our findings to each inspector in the States and the Dominion, and also called attention to the apparent inefficiency of fumigation to destroy the tiny brown-tails.

This statement of information was followed by a prompt report to each state inspector on this continent of all shipments that our system gave us knowledge of. We have received from our correspondents candid acknowledgments and rejoice in the generous statements made by some that but for such reports as we were pleased to make them and the further caution relative to ineffective fumigation, we had undoubtedly been the cause of a successful control of the pest and possibly prevented the foothold it might have secured in a vast area of territory not yet infested.

The unprecedented import of brown-tails in the spring shipments of 1909 gave a fine opportunity to at the same time discover, if present, other pests, but there was little of importance found—I believe only a cluster or two of the eggs of the gypsy moth in a shipment to a sister state.

All plantings of foreign stocks or seedlings made in New York State have been carefully inspected for nests of brown-tail moths, and nowhere have we found that a single one has escaped our inspectors' diligence.

The finding of brown-tails in importations of nursery stock to New York in the spring of 1909 seems without precedent. One would think that having such a conspicuous nest that if seedlings bearing them had been brought here within the past forty years that some of the nurserymen or some of their many men who trim the seedlings leisurely in a warm, light shop one by one, in winter would have recollection of having seen such nests as cover this pest, but only one such case has come to light as a result of much inquiry, and in that case the identification is not conclusive.

Parenthetically I wish to digress from a strict adherence to my subject and speak of the only case of a brown-tail infestation that we had during the year. To a large private estate in Westchester County

a carload of cratægus was shipped late in the fall of 1908 from an eastern state. All the trees were heeled in over winter. In the spring the trees were planted in groups of 12 to 15 trees in an area of about 1½ acres. Later, about the time brown-tails pass to the pupæ, 17 caterpillars were found. It was then too late to spray with arsenical poisons, as feeding had ceased. We had no knowledge as to how many insects were present, but our only course to pursue was to destroy the pupæ wherever they might be and at the same time save the valuable thorns and the large shade trees nearby.

Following thorough inspection, all trees were sprayed two or three times with oil emulsions. The cultivated land and the heavy sod land (after the grass was cut, oiled and burned) was burned over with cyclone spray. Sixty or seventy barrels of crude oil were forced through suitable nozzles and the oil ignited at the end of the nozzle. The sod was burned black and the cultivated part was rolled and reburned. Some portions had three burnings. Entire success seems to have rewarded us, as acetylene gas trap lanterns kept going for ten nights at the right time for moths to fly caught no brown-tails, and subsequent inspection revealed no moths or nests to date.

The state Legislature in April saw fit to amend our horticultural inspection law when their attention was called to the possibility of brown-tail and gypsy moths becoming established in the state. Sufficient appropriations were provided, and the Commissioner of Agriculture was authorized to issue such orders as in his judgment were necessary to control in any emergency.

No box or package of nursery stock brought into the state can be opened without first obtaining consent of the Commissioner. Custom House brokers and importers are required to register their names and addresses in the Department office. They and transportation companies give such information as the Commissioner shall from time to time require.

Last spring custom house brokers were courteous and gave us lists of nearly all of their importations for this and other states, but now with a law to require information they hold, and justly so, that we are entitled to information only relative to stock for New York State.

The following is a summary of the work performed on imported nursery stock:

NUMBER OF SHIPMENTS AND BOXES REPORTED BY THIS DEPARTMENT TO OTHER STATES

State.	No. of shipments.	No. of boxes.	State.	No. of shipments.	No. of boxes.
Alabama	1	....	Nebraska	4	9
California	6	13	New Hampshire. ...	1	1
Colorado	5	7	New Jersey	111	3842 and 125 tubs
Connecticut	22	209 and 28 pckgs.	New Mexico	1	4
Georgia	1	2	North Carolina	1	1
Idaho	6	7	Ohio	56	284 and 12 tubs
Illinois	57	723 and 12 tubs	Oregon	2	2
Indiana	6	39	Pennsylvania	56	494 and 6 tubs
Iowa	11	52	Rhode Island	16	65
Kansas	9	30	South Dakota	1	7
Kentucky	6	33	Tennessee	4	11
Louisiana	2	7	Texas	2	11
Maryland	9	110	Vermont	2	8
Massachusetts	43	287 and 100 trees	Virginia	2	2
Michigan	24	87	Washington	4	13
Minnesota	8	48	West Virginia	2	8
Mississippi	1	1	Wisconsin	5	15
Missouri	9	25	Canada	28	212
Montana	2	4	Washington, D. C.	3	9
				529	6677 Pkgs. 283

NEW YORK

Number of shipments, 860.

3998 boxes 229 bales 33 bundles 185 tubs 121 baskets
Total, 4566

Boxes burned, 707. Bales burned, 2. 7,000 nests destroyed.

We are nearly all of us under obligations to Doctor Howard for reports on shipments of imported stock. If the importations this winter prove to be free or partly free from brown-tails it will be largely the result of his visit to the entomologists in France.

No brown-tails were found on any stock except that grown in France.

We have inspected this fall hundreds of shipments from Germany, England and Holland and a very few from France and no pests have been reported. The bulk of stock used by our nurserymen for budding come from France, and most of it is received in the first three months of the year.

We are seemingly as ready for the work as is possible and shall

attack it with the hope of successfully delaying the establishment of the two dreaded pests in New York State.[1]

Considerable discussion followed this interesting paper by Mr. Atwood. Many members present expressed their obligations to Dr. L. O. Howard and Mr. G. G. Atwood for their great aid in notifying inspectors throughout the country of the arrival of shipments of imported stock to its destination.

Doctor Howard was asked to state the conditions as he observed them in Europe this past summer, and a brief of his remarks follows:

EUROPEAN CONDITIONS AS AFFECTING IMPORTED NURSERY STOCK

By L. O. Howard, *Washington, D. C.*

[Summary of remarks]

Doctor Howard referred briefly to the bill introduced at the last session of Congress regarding the inspection of imported nursery stock, and stated that during a trip to Europe in June last he had, at the request of the chairman of the Committee on Agriculture of the House of Representatives, made a cursory study of the methods of growing nursery stock for exportation to America in certain localities in Europe. He satisfied himself that the conditions in Holland are excellent and that the inspection certificates issued by Professor Ritzema Bos and his assistants can be relied upon so far as any inspection certificates can be relied upon. He found in France that conditions were bad. Nursery stock was grown in certain places quite to the borders of woods and of neglected edges, upon which he found larvæ of the brown-tail moth, the gypsy moth, of two species of *Hyponomeuta*, and other injurious insects not yet introduced into the United States. He found that the conditions under which certificates have been given heretofore in France were such as to render these certificates unreliable. He described an interview with the Director of Agriculture of France, Monsieur Vassiliere, and stated that the latter had promised him to establish at once a governmental inspection service in that country under the Ministry of Agriculture which would enable the issuing of such certificates as would guarantee freedom from insect pests in a satisfactory manner. This service, it was stated, would be placed under the directorship of Dr. Paul

[1] Large numbers of brown-tail moth nests are being found in shipments now arriving from France. January 29, 1910.

chal, who will be empowered to select his own inspectors. The aker described a subsequent visit to England, where he interved members of the Council of the National Horticultural Trades sociation of Great Britain and Ireland and also officials of the Board Agriculture, and expressed the opinion that a governmental inspecn system will shortly be started in England. While admitting that is hardly to be expected that any inspection system will be absolely perfect and thoroughly competent, an honest system will undoubtedly greatly reduce the number of injurious insects which can imported into this country on nursery stock, and will, therefore, reduce the labor of inspection on this side. The remarks were illustrated by a series of enlarged photographs.

Evening Session, December 26th, 1909.

President Washburn presiding.

The following paper was read by Mr. N. E. Shaw, "Increasing the Demand for Orchard Inspection":

INCREASING THE DEMAND FOR ORCHARD INSPECTION

By N. E. Shaw, *Columbus, Ohio*

In addition to the annual inspection of nurseries, the Ohio law provides for the free inspection of any orchard in the state on petition by the owner or lessee of such premises, or of any orchard in dangerous proximity thereto.

The immensity of the nursery business in Ohio, and the inspection duties involved, in properly safeguarding purchasers of this stock, usually requires the entire time of the inspection force for about eight months of the year. As about two thirds of all stock grown in the state is shipped to other states, the majority of the benefits of our inspection do not fall to Ohio orchardists.

Vast quantities of stock enter Ohio from outside sources, and from certain quarters stock infested with San José scale has been repeatedly received. Practically every county in the state has an outbreak of this insect, and in a number of counties the infestation is general. The attack of San José scale and other orchard pests, together with general neglect, has brought family orchards throughout the state into a deplorable condition. The commercial orchardist is alert for any pest which may hinder the proper development of his product and needs but occasional assistance from us. It is the family orchard

which has been neglected, and in order to encourage better care of these places we have attempted to enlarge our inspection operations.

In view of the fact that inspections of such properties, and advice relative to their treatment, are made entirely free of charge, it has been a source of wonderment why more advantage has not been taken of this privilege. Until the present year an average of about one hundred petitions were received yearly, and these came largely from commercial orchardists, and from nurserymen for the purpose of having adjacent places properly treated. Careful inquiry into the matter has revealed the fact that many farmers, who do not pay particular attention to horticultural affairs, were not aware that such inspections are made free of charge, while many feared that wholesale destruction of trees followed these examinations. Unscrupulous fruit tree agents have largely been responsible for the latter impression, as such parties often wished to avoid, as far as possible, an examination of the stock sold by them.

A general inspection of the orchards of the state is out of the question with the present funds available for this work. If, however, we can make the demand for orchard inspection insistent enough, we feel sure that our legislature will be induced to provide ample funds so that sufficient aid may be given to all who desire to produce better trees and better fruit. To this end efforts have been made to place these opportunities before as many farmers of the state as possible.

County infirmaries of Ohio are usually provided with fair-sized orchards. Arrangements were made during the present year to hold spraying demonstrations at these places. The meetings were well advertised through county papers and mailing lists, and the orchards being centrally located a large attendance was invariably secured. A careful inspection of the orchards was made and different pests pointed out. Several trees were properly pruned, young ones being shaped in the way they should grow and old, large ones reduced and thinned in such a manner as to permit thorough spraying. Spraying solutions were next prepared and applied with a good spraying outfit suitable for use in family orchards. At the close of the meetings statements were made in regard to the value of orchard inspection and the advantage of a conference with an inspector relative to controlling the pests which might affect different orchards. Petition blanks were then given to all desiring them and an inspection promised after the receipt of these petitions.

A number of county agricultural societies in the state have signified a willingness to select orchards for the purpose of having demonstrations given, and as many of these meetings as possible will be held

during the coming year, following largely the same plan as that used at county infirmaries. By interesting these societies, whose duties usually consist in conducting county fairs, we hope to secure a better recognition of horticultural products by more liberal premiums for perfect fruit, thereby encouraging better care of the home orchard.

During the past summer an exhibit, consisting of destructive insects, diseases, nursery stock, affected fruits, spraying materials, nozzles, etc., was made at the state fair and one county fair. The interest taken by visitors required the constant attention of two men in explaining the different parts of the exhibit. The necessity for better care of orchards and the advantages of inspections were impressed upon all interested and petition blanks given to those desiring the same.

For the coming year, efforts will be made to visit as many county fairs as time and funds will permit. Almost every county of the state has a county fair, and a splendid opportunity is thus offered to bring our work before the people.

State Farmers' Institute speakers in Ohio are required to fully explain at each institute the work of the Division of Nursery and Orchard Inspection and the advantages of having orchards examined. Assistance is promised to beginners in spraying operations and all are urged to take advantage of these opportunities. As there are 325 institutes in the state, having an average attendance of 150, large numbers of farmers and fruit growers are reached in this manner.

We have on our files nearly 700 county and daily papers of the state, and the majority of editors are glad to publish terse statements relative to our work. It is our opinion and experience that more people can be reached by short items through the medium of county papers than through more extended articles in the agricultural press.

In all talks before farmers' institutes, farmers' clubs, granges and high schools the writer urges the necessity for better care of home orchards and ornamental plantings. Several high school superintendents have asked for spraying demonstrations before their students, and it is perhaps here that the greatest good along these lines can be accomplished. No set notions of long standing are encountered and great willingness is found to adopt and execute new ideas and methods.

That our demonstrations of last spring have accomplished results is very apparent from the demand for our work in those counties where these meetings were held. Quite frequently, when an inspector has been sent into these localities to make a few examinations, the requests for his services became so numerous that practically every place in the community was visited. From these counties we are sure of aid in

securing better recognition from our legislature, and will therefore be able to increase our operations along these lines.

It has been gratifying indeed to receive many letters from sections where spraying demonstrations have been given, speaking of the good results secured from the first attempts at spraying, and of plans to do the work more thoroughly in succeeding years.

Four times as many requests for our services have been received during the present year than in any one other year of the work. This encourages us to continue on a larger scale the methods in vogue.

DR. J. B. SMITH: I wonder how many of us have run across the same trouble that is mentioned in this paper; that is, the failure on the part of the orchardist to ask for an inspection. I know that this is the failing of a good many in New Jersey, and I wonder whether the accounts which were published at the beginning of this work concerning orchards, which we ordered to be taken up, has been gotten up in such a shape as to make it difficult for the true condition of the work to reach the farmers and fruit growers. Sometimes a statement of that kind is taken up by horticulturists, and it takes a long, long time to outgrow it. We find that difficulty in New Jersey.

If we had a law requiring an inspection of every orchard, it would greatly facilitate matters. We find a whole lot of people who are willing to take advantage of it.

MR. WORSHAM: We notice that when a request is made for an inspection it is usually for an inspection of a neighbor's orchard. A man knows the condition of his own orchard, and he does everything in his power to increase its growth, but he usually comes around and makes a request for an inspection of his neighbor's orchard. We are aware of scale being present in most orchards, as it is in almost every fruit-growing section of the state.

MR. HEADLEE: The Farmers' Institute in Kansas has a special agent connected with the Agricultural College, and has been able to engage a practical, up-to-date horticulturist. This man goes about doing their "Institute" work, and doing the same kind of work as mentioned by Mr. Shaw. The work which this man has to do is very interesting. As to the demands on his time as a consultant agent, he is not greatly in demand. The people do not realize as yet what good fruit growing means. We are educating them up to the point where they will realize it, and it is done through this Institute. This man goes to every county during the year, and comes in personal contact with the people, and in the next two or three years he will be so busy in his

e that he will not be able to do anything else. There are many townships in Kansas where you can raise orchards, but you would have arry water in a tin dipper to wet them. It seems to me that we are t in the beginning of this kind of work. The Institute work in nsas is entirely in charge of the Agricultural College. At the last gislature $50,000 was appropriated for this purpose.

MR. HITCHINGS: This matter is of great importance to us at the sent time, especially in Maine. With us, our "Institute" work is ried on by the Department of Agriculture, and we are holding some special "Institutes," followed by a week of fruit shows.

Some orchards have been inspected during the past few weeks. I had a man with me and we have noticed that the majority of the trees are covered with canker. The matter of holding entomological exhibits at county fairs is very important. We have furnished such exhibits for several years in our state, and at present the demand is greater than we can supply. I have three sets for such purposes, containing forty-eight mounts. We exhibited at thirty different fairs this past year, and did not nearly fill the demands.

In regard to orchard inspections, there is a great demand which we cannot fill. They do not know what to do with their orchards in Maine and are anxious to find out.

MR. TAFT: In Michigan the "Peach Yellows" has been known for twenty-five years and the "Little Peach" some fifteen years. So far as the state inspection goes, we do a large amount of work throughout the nurseries. The orchards are inspected by local inspectors. Three inspectors are appointed in each township, and we are fully satisfied that they are competent. It is often necessary to take new inspectors into the orchard for a day or more in order to point out the proper course to be pursued. In Michigan we bring the work of the "Institutes" and inspectors close together, and, furthermore, the appointment of the speakers at the institutes, as well as all the inspectors of the state, are in my own hands, and I am thus able to use quite a number of nursery inspectors as institute lecturers. They are competent to discuss fruit growing and matters of that kind, and in the spring months hold their demonstration meetings in the orchards. Many inspectors are very competent for this work.

We have several hundred townships where we have a board of three inspectors. It would not be possible for us to carry on this work with the state inspectors only.

We have four hundred and twenty-five "Institutes" throughout the winter, and perhaps sixty or seventy railroad "Institutes," and nearly all of these are well attended.

We have an expert fruit grower, and sometimes two, at each "Institute" to do the talking. Some of these men are practical horticulturists, while others have taken courses in horticulture and entomology at the Agricultural College.

NOTES ON THE STATE NURSERY LAWS OF OKLAHOMA AND THEIR EFFECT

By C. E. SANBORN, *Stillwater, Oklahoma*

The nursery inspection laws of Oklahoma as outlined at present are brief, but far reaching in effect. The nurseries of the state are the primary objects of this legislation, though injurious insects or diseases outside the confines of a nursery likewise come within the provisions of the act. Large discretionary powers are given the State Board of Agriculture, and the nurseryman is held responsible by law for selling inferior grades of stock and stock untrue to name.

Many nurserymen and especially agents from nurseries of other states have heretofore found it convenient and profitable to line out all stock held for sale but not disposed of in season, for the purpose of disposing of it the following or even the second following season. This sale of such trees as first grade stock is now declared illegal, since such lined out stock is of inferior grade. The benefit to the public accrues not solely by protection through elimination of "debilitated" stock, but also from the consequent elimination of an undesirable class of irresponsible nurserymen.

The protection of the law does not leave the nursery stock when the latter is shipped from the nursery, as many nursery laws do, but persists for a period of seven years, so that stock may have ample time to establish its identity. If true to name, it is exempt from legal penalty provided it is free from any injurious diseases or insect pests. This is true of all agricultural products, such as seeds, fruits, grains and vegetables.

The law protects horticultural and agricultural industries as above outlined. Furthermore, it empowers the State Board of Agriculture to promulgate, as the occasion demands, rules and regulations governing any evil or apparent evil relating to seeds, plants, insects or diseases.

The effects are now quite obvious. The wild-eyed speculator who a few years ago posed as a fruit tree dispenser of unbounded integrity, has lately either changed his vocation or his methods of speculation. The result is that the honest nurseryman now has the advantage in his favor, and the people are beginning to recognize not only

this but also the fact that the advantage lies in their favor. As a consequence, the rules governing the sale of nursery stock by agents of nursery companies have done much to strengthen the integrity of the nursery business.

The law and the rules promulgated by the State Board of Agriculture give ample power to the State Inspector of Nurseries. The entomologist of the State Experiment Station at Stillwater is by virtue of his office State Inspector of Nurseries. All nursery stock must be inspected by him or his deputy during the growing season. All nurseries desiring inspection are expected to report to the Secretary of the State Board of Agriculture at Guthrie. As a general rule, all the first class nurserymen write early in the season and state whether or not inspection is desired. This enables the inspector to arrange such an itinerary as will enable him to visit all the nurseries with the least possible expenditure of time and money. One bad feature resulting from dependence on reports is that nurserymen beginning or retiring from business almost invariably fail to communicate in time to save trouble and expense. The nurseries of this state are not the only places embraced in the inspector's sphere of action. Every farm, town or city, public park and cemetery is subject to inspection. In addition, carriers of the products under discussion and freight and express offices may be mentioned.

The expense of investigations and inspections is defrayed by the owner or owners. Until now the nurserymen have met all obligations. Under a proposed law a fund is to be appropriated by the state for carrying on all of the work coming under the nursery inspection laws. The idea is to provide an appropriation which shall remain as a permanent resource, and as it is expended be replenished each year by the person or persons benefited. For instance, if John Jones has an orchard in Oklahoma which needs the inspector's attention, necessary funds are withdrawn and the inspector proceeds with the work. If John Jones does not follow instructions the necessary labor may be performed under the authority of the inspector and the expense, if not met voluntarily, may be legally collected in the same way as a tax.

The interim may be short or long as far as the inspector is concerned because the money expended in conducting the work is not personal. In some instances trips of investigation must necessarily be made, the expense of which cannot be collected. For instance, a well substantiated report may come to the inspector, to the effect that John Jones is selling stock which has not been inspected according to law. If, after investigation, the inspector finds that such statement is false, John Jones should not be compelled to defray said expenses of inves-

tigation, and, as a consequence, the state would have to foot the bill. Expenses which might be incurred under such or similar conditions would be comparatively small and would be the only drain on the state appropriation. As a result the appropriation would practically constitute a permanent fund to be used over and over again.

The general effect of these laws for state protection is quite apparent. There is practically no weak place existing in them, since the State Board of Agriculture has the power of adjusting all requirements.

It has heretofore occurred that this office has received orders from nurserymen, after the regular inspection season, to proceed at once to their nurseries to make inspection since they desired a certificate. In many such instances they were asked to guarantee traveling expenses and payment of a per diem fee ($5).

Such examples show that the law is economical and effective. Some nurserymen who have very small nurseries (and also, too often, *small knowledge* of the business) look upon the law as unjust, since their expenses of inspection are comparatively greater than for larger nurseries. The law, of course, is not meant to curtail business, but to promote it. The so-called "nurserymen" who have no knowledge of the business should be eliminated for the benefit of the public. Their elimination has but little effect and does not particularly benefit the responsible nurserymen as is sometimes supposed.

The weight of the law does not fall entirely upon the nursery business. It is equally effective for the agriculturist. The nurseryman is wont to believe that he bears the burden alone. This is untrue. The farmer bears his proportionate share. If an injurious weed is allowed to become established, the farmer is held responsible for it, and the treatment for the same is charged to him. The same may be said of the owner of a shade tree in the city. The tree must be kept free from injurious pests and diseases as defined by our nursery laws or regulations.

The conclusion is clear and plain that the expense of freedom from obnoxious pests must be borne by the parties concerned. The law promulgating this freedom is new and its machinery is not yet in thorough working condition, but its parts are all present and perfect and the driving power is unlimited.

[The Proceedings will be continued in the next issue.—Ed.]

VALUE OF SODIUM CYANIDE FOR FUMIGATION PURPOSES

By R. S. WOGLUM, *Special Agent, Bureau of Entomology, U. S. Department of Agriculture*

For almost three years the United States Bureau of Entomology has been conducting in California an investigation of the use of hydrocyanic-acid gas for the fumigation of citrus trees, with the object of placing this very extensive practice on a more economical and effective basis. A preliminary report on results of one problem taken up during this investigation is given in the present paper.

With the exception of an instance noted below, cyanide of potassium has been the chemical used both in this country and abroad in generating hydrocyanic-acid gas for all fumigation purposes, including the fumigation of orchards, nursery stock, greenhouses, mills, dwellings, infested fruit, seeds, etc. There is, however, a second cyanide compound, cyanide of sodium, which is used more extensively for other general commercial purposes than the cyanide of potassium.

C. P. Lounsbury, Government Entomologist of Cape Colony, was the first to call attention in literature to sodium cyanide for fumigation, when, in 1905, after stating that the sodium compound yields more gas from a given weight than the potassium (the actual yield is between one fourth and one third greater), he stated that the former might possibly within a few years be used instead of the potassium salt. This supposition seems to have been based entirely on the consideration of the greater yield of gas of the former.

Early in the investigation it was learned that, unknown to the consumer, sodium cyanide has been used to a limited extent in California in practical orchard work for a number of years. This was a 99–100 per cent product instead of the 132[1] per cent which is the gas strength of the chemically pure sodium salt. Sodium cyanide has been sold under the name "American" cyanide, in distinction to "German" cyanide, which is the 98–99 per cent potassium salt commonly employed. The consumers have considered both brands to be potassium cyanide, the popular distinction being that one was made in America while the other was imported from Germany. Although the 99 per cent sodium cyanide contained fully as much cyanogen as the regular 98–99 per cent potassium cyanide, as well as being less expensive, yet it has had a very limited use, due to the inferior results obtained with it against the pests of citrus trees. Furthermore, extensive experi-

[1] Styled 132 per cent to indicate that 100 pounds sodium cyanide equals in gas product 132 pounds of potassium cyanide.

ments carried out by the chemists of a cyanide manufacturing firm which supplies the cyanide used in California led them to believe the sodium salt was inferior to the potassium in field work.

Under the belief that the sodium cyanide had not been given sufficiently exhaustive tests the writer ignored all this local unfavorable evidence, and, in December, 1908, outlined in detail a broad series of chemical experiments to secure reliable data with reference to this salt on the various factors which enter into hydrocyanic-acid gas generation. This outline of work was submitted to the Bureau of Chemistry of the United States Department of Agriculture for execution. Dr. C. C. McDonnell, under the direction of Dr. J. K. Haywood, Chief of the Miscellaneous Division, made a very careful and elaborate series of determinations, and, in August, 1909, the results of these were submitted to the writer in a carefully prepared manuscript and are used in part in the preparation of this preliminary report.

Results of Experiments

Proportion of Chemicals. In using a high grade cyanide of sodium it was found that a splendid generation of gas occurred when the proper proportions of chemicals were taken. The results of a large series of tests determined the proportion as follows: Three ounces (Av.) of cyanide, four ounces (liquid) sulphuric acid and six ounces (liquid) water. Reduced to its lowest units for rapid work in the field I have used 1½ ounces of acid and 2 ounces of water to each ounce of cyanide of sodium. This 1–1½–2 formula is recommended. With a pure cyanide it results in less than two per cent of gas remaining in solution in the residue. The reaction, which liberates the gas from a high grade sodium cyanide, produces exactly as perfect generation as from a high grade potassium cyanide. One might conclude from this single consideration that the sodium compound would be equally valuable in field results. It must be kept in mind, however, that these experiments were carried on under the careful methods of the laboratory and not the crude ways of the field; also that past experience with a 99–100 per cent article had shown it to produce results much inferior to those secured from the same percentage of the potassium salt.

Field Tests. In August, 1909, one and one half acres of orange trees severely infested with purple scale (*Lepidosaphes beckii*) were fumigated with a 124[1] per cent sodium cyanide, using the 1–1½–2 formula. Three strengths of gas were used, calculated from the cyan-

[1]See note on p. 85.

present in the sample as equivalent to 1, 1¼ and 1½ of the regular Schedule I for potassium cyanide as given in Bulletin 79, United States Bureau of Entomology. The results of these experiments show that not only is the effect on the insects as destructive as with equal strengths of potassium cyanide, but rather more so. Whereas it required a 1½ schedule of potassium cyanide for eradication, a 1¼ schedule of the sodium produced the same result. This would signify that under the crude conditions of orchard work a high grade sodium cyanide gives a better generation of gas than a high grade potassium.

For the sodium cyanide two parts of water were shown to be best in the laboratory tests, whereas in the earlier field work referred to three parts were used. The greater production of gas from two parts of water over three parts, called for in the dosage schedules for the potassium salt, is probably one of the reasons for the superior field results later obtained from the sodium salt.

Other experiments with a high grade sodium cyanide have been performed. The results of these, so far as examined, have shown the sodium to be at least equally efficient with the potassium.

Effect of Sodium Chloride on the Production of Hydrocyanic-Acid Gas. Newell in 1905 pointed out that sodium chloride, when present in the reaction producing hydrocyanic-acid gas, results in a partial decomposition of that gas. In order to ascertain more thoroughly the status of this salt, a large amount of experimental work has been carried out. These tests not only corroborated Newell's results, but also showed that if a sufficiently large percentage of sodium chloride was present the decomposition would be so great as to result in the liberation of little, if any, cyanide gas. The practical value of this consideration is that all commercial cyanides contain more or less sodium chloride. Analysis of a sample of the brand of sodium cyanide formerly used in California orchard fumigation showed it to contain 14.2 per cent sodium chloride. The amount of cyanogen present was 101 per cent. While a 97 per cent commercial potassium cyanide, containing only a trace of sodium chloride, yielded 94 per cent of its total gas, this 101 per cent sodium cyanide yielded only 63 per cent of its total, 34 per cent being decomposed, due to the presence of the chloride. Other brands of 98–100 per cent sodium cyanide submitted were shown to contain proportionately larger amounts of sodium chloride.

The presence of sodium chloride accounts for the failure of these cyanides in past fumigation work.

Conclusions

1. It has been shown above that a cyanide containing a high percentage of cyanogen is not the only consideration in determining its use for fumigation purposes. Of equal importance is that it be practically free from sodium chloride. A cyanide containing in excess of one per cent of sodium chloride should be condemned.

2. In field work, as well as in the laboratory, high grade sodium cyanide has produced exactly as satisfactory results as high grade potassium cyanide. In fact, the results from the field tests thus far examined indicate that the former, under the crude conditions prevalent in orchard fumigation, is slightly superior to the latter. A sodium cyanide of less than 123 per cent purity should never be used. Preferably the purity should be from 126 to 130 per cent. Such a high grade chemical seldom contains more than a trace of sodium chloride.

The price of the 126–130 per cent sodium product is almost the same as that of the 98–99 per cent potassium salt. The former produces at least one fourth more gas. After deducting the cost of the greater amount of acid required to liberate the gas from the sodium cyanide we still have an economy of between 10 and 20 per cent in favor of the sodium salt.

From these considerations, as well as the fact that the rapid exhaustion of the deposits of potassium carbonate, which is the source of potassium cyanide, has been causing the price of this cyanide gradually to increase, leads the writer to believe that in a few years the use of sodium cyanide for fumigation purposes will become general.

SUPERPARASITISM: AN IMPORTANT FACTOR IN THE NATURAL CONTROL OF INSECTS[1]

By W. F. Fiske

In his study of the parasites of the white marked tussock moth, the results of which were published as Bulletin No. 5 of the Technical Series, Bureau of Entomology, Dr. L. O. Howard says of the oviposition of the common parasite, *Pimpla inquisitor:*

"It happened on several occasions that the adult Pimpla was observed to oviposit in tussock-moth caterpillars which were already infested with Tachinid larvæ. Several such caterpillars were isolated

[1]Occasional contributions from the Gypsy Moth Parasite Laboratory, II.

observation, and in every case but one there was no development to urity of either the dipterous or the hymenopterous parasite. In case, however, an adult of the Tachinid *Euphorocera claripennis* ed from such a caterpillar. The probabilities are that its larva already well grown when its host was stung by the Pimpla and that the larvæ of the latter failed to find sufficient nourishment for development.

"Such instances would seem to show that the maternal instinct is not so prescient as has been supposed, and that all the preliminary investigation of the host insect by the mother parasite and all the apparently anxious soundings and tappings with her antennæ, while appearing to satisfy her that everything is all right, do not always result in the depositing of the eggs under just the proper conditions. It is altogether likely that other parasitic Hymenoptera occasionally, and perhaps frequently, make similar mistakes, and that many parasites suffer from this rivalry based upon erroneous instinct, as well as from the attacks of hyperparasites. Such mistakes are, of course, much more likely to occur during such times of extraordinary multiplication than when the species are normally abundant."

Upon other occasions, similar observations have been made and commented upon both in Europe and in America, but in no case which has come to the attention of the writer has their significance been so clearly understood as is indicated by the above quotation. It is his present opinion that such double parasitism is of much more than incidental and academic interest.

In the brief account of the parasites which had been reared from the cocoons of *Samia cecropia* and *Callosamia promethea,* which appeared in No. 6 of the second volume of the JOURNAL, something was said of the various forms of double parasitism which were encountered. A large number of other observations of a similar nature are recorded in the note files at the Gypsy Moth Parasite Laboratory, and from time to time, as opportunity permits, it is hoped and intended to publish certain among the more interesting and suggestive of these. For the present it is merely intended to propose the term *superparasitism* to designate these phenomena, to define this term, and to attempt to demonstrate the importance of the principle involved in the natural control of insects.

Definition. Superparasitism results when any individual host is attacked by two or more species of primary parasites, or by one species more than once. It differs materially from secondary parasitism, or hyperparasitism as it is variously called, although both are, strictly speaking, double parasitism of an individual. In superparasitism the

parent females are both attracted to the primary host primarily for its own sake. In hyperparasitism one of them is attracted to the primary host secondarily and incidentally, and for the sake of the primary parasite which it harbors.

It is difficult to draw a hard and fast line which shall separate all forms of double parasitism into either the one or the other. There are several instances in which it is difficult to determine which relation the parasite actually occupies. Theronia, for example, is indubitably primary on occasion, but at the same time so frequently superparasitic as to make it appear that it is attracted by the presence of the other parasite as strongly as by the primary host. It has been the cause of a great deal of perplexity in the work of parasite introduction, solely on account of this doubt as to its true nature, and it was a long time before it was definitely determined to be primary more frequently than it appeared to be secondary. It is at present considered to be a true primary parasite, but one which is in danger of becoming a true hyperparasite in the course of its further evolution.

Manifestations. The manifestations of superparasitism are exceedingly diverse, and as in the case of Theronia oftentimes puzzling to the observer. The most conspicuous is that which has been defined by Mr. W. D. Pierce in his discussion of the parasites of the cotton boll weevil[2] as "accidental secondary parasitism," a term which applies very well indeed to this form of superparasitism, but not at all to the others. Accidental secondary parasitism occurs frequently in connection with other hosts than that upon which Mr. Pierce conducted his investigations, and it is characterized by the larva of one parasite developing at the expense of another in very much the same manner as would that of a true secondary parasite under similar conditions. The only real difference is that already set forth in the definition given, that in the one case the second parasite is attracted to the primary host, and in the other to the host because it is already parasitized.

In the very great majority of instances one parasite is destroyed through the premature death of the primary host due to the attack of the other. Under such circumstances the evidences of superparasitism are only apparent through a careful dissection and microscopic examination of the host remains. The larva of the parasite which suffers destruction may or may not be devoured by the other in such instances.

Frequently both parasites die without either completing its transformations, but usually, though not always, they are stunted and weakened, and their powers of reproduction are seriously curtailed. Sev-

[2]Bull. United States Department of Agriculture, Bureau of Entomology.

experiments which have been planned and executed for the express purpose of determining this point have indicated in each instance that the reproductive capacity of *two* parasites which developed on a host just large enough for one, was very much less, combined, than that of one developing under otherwise identical conditions. In one instance in particular, although several times as many individuals were secured as the result of superparasitism, they were unable to reproduce at all. It is, therefore, evident that the indirect results of superparasitism may be greatly to the disadvantage of the parasite, as well as the direct results following the premature death of the host.

Classified somewhat more formally, the manifestations of superparasitism are as follows:

(I) One parasite lives; the other dies.

(a) The survivor preys upon the other as an accidental secondary parasite. Of common occurrence.

(b) The survivor destroys the other by bringing about premature death of the host, and may or may not devour it incidentally. Of common occurrence.

(II) Both parasites live.

(c) Neither are the worse for the circumstances. Very rare.

(d) One or both are so seriously weakened and stunted as to bring about a material reduction in their capacity for reproduction. Common.

(III) Neither parasite survives.

(e) This may be brought about through premature death of the host through excessive parasitism (commonly); or,

(f) Through inability of either parasite to complete its transformations on the limited supply of food. Common.

Instances illustrative of several of the above conditions were mentioned in the paper upon the parasites of the Saturniidæ, to which reference has already been made.

It is interesting and important, in this connection, to note that in those instances which fall in division I, the surviving parasite is not infrequently seriously dwarfed and proportionately weakened. The results, therefore, are equivalent to those obtaining in section III.

Prevalence. The prevalence of superparasitism depends entirely upon whether or not the female parasite is gifted with a prescience which will enable her to select healthy hosts for her offspring. Presupposition that she possesses this instinct is equivalent to a denial of the existence of superparasitism. This is indubitably *not* in accordance with conditions as they exist in the field and laboratory.

Total absence of any such instinct makes the prevalence of superparasitism wholly dependent upon and governed by the law of chance. If it could be shown to be the rule, a calculation of the probabilities of the occurrence of superparasitism would be a comparatively simple problem in mathematics.

In so far as those parasites are concerned which, like certain of the Tachinids and apparently of a few among the Hymenopterous parasites, deposit their eggs or young larvæ upon the food or the food plant of the host, it must be conceded that the laws of chance apply with scarcely any modification. A Tachinid, which deposits its eggs upon the foliage of trees infested by caterpillars of its favored host to be eaten by them, is trusting wholly to chance and to nothing else. The fact that the parent fly is attracted to the vicinity of the host before depositing her eggs affects the matter not at all, because no particular individual is selected or can be selected for the attack.

In the case of those which attack a selected host it is easily conceivable that a highly developed instinct might enable the parent to govern her selection, but that such is not the universal rule is as easily demonstrated. Until very recently it could have been stated without reserve that not a single parasite among the many studied at the laboratory indicated in any way the possession of such discretionary powers. At the present time the statement cannot be made thus unrestrictedly, but it can still be said of the vast majority of the species which have been the subject of more or less thorough study. In a very few species, relatively, faint indications of such prescience on the part of the parent females are apparent.

In the opinion of some, mathematics and entomology exemplify, respectively, the most exact, and one of the least exact among the sciences, and the writer is well aware of the dangers which attend any attempt to combine the two, but if, as must be conceded in some instances, and as may yet prove to be the fact in all, the prevalence of superparasitism is determined by chance alone, it is interesting to speculate a bit on what might occur under fixed conditions.

Given 100 insects, suitable as hosts, and equally attractive to a given species of parasite, inhabiting a restricted territory (call it an island), and let each of them be equally exposed to parasitic attack. Let one fertile female parasite capable of depositing several hundred eggs be given free access to her favored host under these conditions. Suppose, what is perfectly possible, that the parasite is unable to choose between hosts which are healthy and those which are already parasitized.

With the deposition of the first egg, a parasitism of 1 per cent re-

ts. The second egg, if deposited in a different caterpillar, brings ut a parasitism of 2 per cent, but there is a chance that it will be sited in the same host. The odds, to be exact, are 1 in 100, so ead of 2 per cent of parasitism, the chances are even that the para- sm is 1.99 per cent. This is, of course, impossible with only 100 ts, but there is no other way to express the conditions.

The third egg is much more likely to be deposited in a third caterpillar than otherwise, but at the same time there is the 1 chance to 100 that was mentioned above, which must be taken into consideration, and in addition 2 chances to 100 that it will be deposited in one or the other of the two hosts previously attacked. Reduced to percentage, the chances are that instead of 3 per cent of parasitism as the result of the deposition of three eggs, it will be 2.9701 per cent.

As parasitism progresses, there is, obviously, a rapidly increasing chance that the parasite will select an already parasitized host for attack, and by the time that ten eggs are deposited there is an even chance that one among them is wasted. When a parasitism of 50 per cent has been reached, the chances are even that no less than 10 have been similarly wasted, and the chances are against instead of in favor of the selection of an unparasitized host ever after.

Instead of 100 per cent of parasitism resulting from the deposition of 100 eggs, chance favors a parasitism of about 64 per cent. In other words, out of 100 eggs 36 are likely to be deposited in hosts already attacked. If the parasite continues oviposition, it is an even chance that 77 out of the next 100 eggs will be injudiciously placed, and 92 out of the third hundred. This is a total of 205 out of 300 eggs which have been wasted. It will, in theory, require about 450 eggs to bring about 99 per cent of parasitism, and since the odds are now 100 to 1 *against* the parent selecting the last remaining unparasitized individual, more than 500 eggs in all must be deposited before 100 per cent of parasitism may reasonably be expected.

In the accompanying diagram, the vertical lines are indicative of the number of parasite eggs deposited, and the horizontal of the hosts attacked. The straight line AB, indicates the percentage of parasitism which would result were the female parasite capable of intelligent selection of her host, and the curve, AC, that which would theoretically result under conditions as above outlined.

That the calculation is not altogether fantastic is indicated by certain experiments which have been carried on in the laboratory, in which conditions not so very different from those prevailing in the imaginary island have been artificially produced. The results have not been exactly in accordance with the curve as shown, but nearly

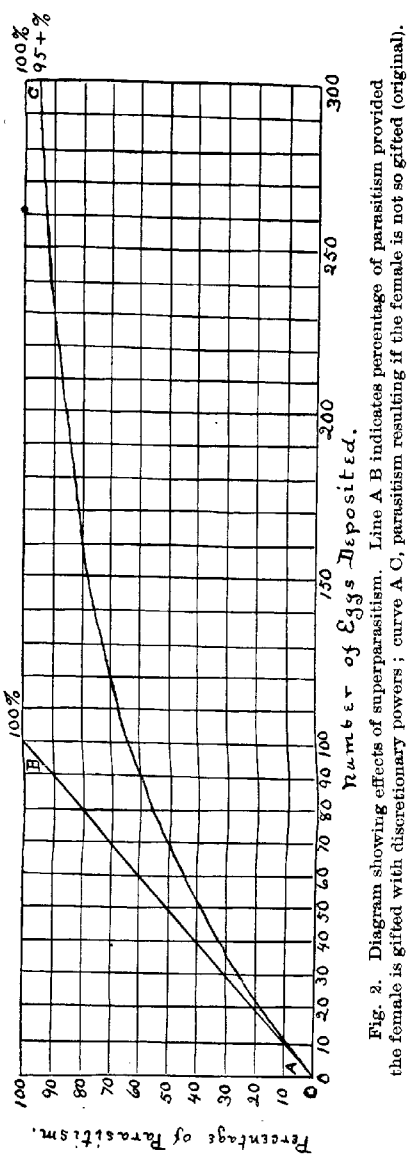


Fig. 2. Diagram showing effects of superparasitism. Line A B indicates percentage of parasitism provided the female is gifted with discretionary powers; curve A C, parasitism resulting if the female is not so gifted (original).

ugh so to indicate that it has a certain basis upon fact. It is probe that the actual curve would vary under identical conditions, but th different species of parasites in accordance with the development the maternal prescience of each, but it is probable that in every stance it would lie somewhere between the lines AB and AC, which present the limit of variations under conditions as given.

Actually, in the field or in the laboratory, it would frequently fall outside of AC; that is to say, superparasitism would be distinctly more prevalent in proportion to the percentage of total parasitism. It is usually the case that a part of the hosts are more exposed and therefore more liable to parasite attack than the rest, and these will be attacked to the benefit of the others. Repeated instances of this sort have arisen in the course of the work.

Economic Importance. If, as seems probable, the utilization of the natural enemies of injurious insects becomes a well established method of insect control (if indeed it has not already become so), every phase of insect parasitism takes on economic importance proportionately. Superparasitism is undoubtedly the equal of hyperparasitism in its effect upon the natural control of parasitic insects, and should be given equal attention. Only upon very rare occasions, as shown in the table of its manifestations, does it permit both of the parasites involved to reach full maturity. In the minority of occasions only one of them does so, and in the majority both are seriously affected, if not destroyed outright.

As stated above, its actual prevalence is apt to be greater than indicated in the diagram, and has been greater in certain work which has been carried on at the Melrose Highlands laboratory. In the course of this work three genera of parasites have been brought under successful laboratory control, and their propagation undertaken as an economic enterprise. In every instance superparasitism has resulted to an extent comparable to that indicated by the table, *counting only those hosts which are equally exposed* to attack by the parasite, and leaving out of consideration those which were partially protected. In the instance of two of the parasites, superparasitism resulted in the production of dwarfed and worthless individuals, which proved to be of little, and in one instance of no, value for continued reproduction. In the instance of the third parasite, superparasitism resulted in the death of all but one of the individuals attacking an individual host, and the survivor emerged apparently none the worse for its prioristic combats. In this case the outcome was nothing worse than a reduction in the rate of multiplication; in the others there was a serious additional loss due to the degeneration of the survivors, which was not

offset by their larger numbers. Similar conditions may be expected to prevail in the field.

More than 50 per cent of parasitism by species which attack the pupæ of any lepidopterous insect is rare or appears to be so, and has never been encountered in the experience of the writer. A higher rate of mortality frequently results when the pupa of the host is also affected by parasites which have attacked it during its larval stages, as for example in the case of the tussock moth which dies after constructing its cocoons through parasitism by Tachinids, as well as by Pimpla and Chalcis. If the parasitism by Tachina amounts to 50 per cent and of Pimpla and Chalcis together to 50 per cent, it is safe to say that 25 per cent of the host will escape attack entirely, and that a considerable majority of the parasites, taken altogether, will be involved in a conflict between themselves. This conflict, as already stated, may result variously, but with rare exceptions to the disadvantage of one or both of the participants.

It is very largely on this account that it is deemed inexpedient to depend upon the parasites, which confine their attack to any one stage of the host, to effect the control of an insect like the gypsy moth, which is subject to the attack of several distinct groups of parasites at different stages in its career. It is recognized that the parasites have their own enemies to contend with, and that they are subject to all of the other and various controlling influences which go to maintain the stability of the natural balance. Add to these the losses which they would suffer through undue superparasitism, and the chances for their continued increase to the point where they could be expected to exert effective control of an insect so fecund as the gypsy moth are greatly reduced.

The importance of superparasitism, in its relations to hyperparasitism, is also considerable. It is probable, in the last analysis, that true *tertiary* parasitism will be found to be of rare occurrence, and that instances in which a secondary parasite is attacked are, for the most part, examples of superparasitism pure and simple. The destruction of host by parasite, and parasite by hyperparasite may be, and frequently is, carried beyond "quarternary" and "quinquenary" parasitism, but in relatively very few instances are the species involved incapable of attacking the original parasite as well as its secondaries.

The general subject of parasitism, as a factor in the natural control of insects, is of course the main, and almost the only subject under consideration at the laboratory. Its phases are manifold and varied in the extreme, but there is hardly a single one which is not involved more or less directly with some phase of the subordinate topic of super-

sitism. In any discussion of the progress of the general project, or of any of its ramifications, superparasitism will enter and must be considered. On this account, the writer begs the indulgence of entomologists for the introduction of a new term into an already overburdened vocabulary.

AMARA AVIDA SAY AS A STRAWBERRY PEST

By JOHN B. SMITH, Sc. D.

That certain of the *Carabidæ* will, under some conditions, vary their normal predatory habits by feeding in the adult stage upon vegetable matter is well known, and almost every collector has seen some of the species of *Harpalus* in late summer feeding upon the seeds of grasses and rag-weed. In Europe *Zabrus* is known to have similar habits and to appear in some cases as a genuine pest.

Just why these occasional general resorts to plant food occur has never been satisfactorily explained, for several years in succession may go by without any appearance of the insects on seeds, and then, for a year or two, they will be noticed in many localities.

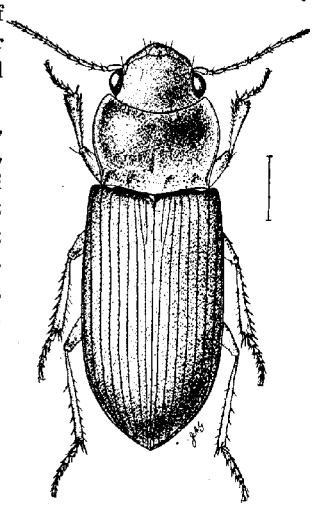


Fig. 3, AMARA AVIDA Say (Original).

In 1900 two species of *Harpalus, caliginosus and pennsylvanicus,* were found in Pennsylvania and Ohio, injuring strawberries, just ripening, in June, by eating out the seeds, and in the process so mutilating the flesh that the berries became unsalable. Webster in Ohio and Slingerland in New York reported these outbreaks, and described the work of the insects and their habits very carefully. But there seems to be no explanation for the sudden increase so early in the season, and the occasion for the resort to the strawberries.

During the early days of June, 1909, I made a trip through the strawberry region of Cumberland County, New Jersey, and was advised, as I approached the Maurice River, of a new "bug" that ate into the ripening strawberries and destroyed the entire crop. No one had ever seen its like before, and the descriptions left me wholly at sea concerning its identity. The statement that they ate each other

up when a lot of them were put together suggested Carabids; but the size, color and active diurnal habits of the species seemed to negative this, and it was not until I actually saw the specimens that I recognized the depredator as *Amara avida* Say. The insects had been only recently matured, many of them were not yet fully colored and some of them had the chitin not yet fully hardened. This gave the majority a lighter, more brownish bronze color than normal, and had helped to lead me astray, since everybody referred to them as brown in color.

The insects were present in great numbers on a comparatively small area of young beds, and practically every berry was destroyed. Fortunately, it was the first year out, and the crop was small; but the owners feared for the future. This particular species is not one of the more common ground beetles and, so far as I am aware, has never been accused of doing similar injury; so I was interested to discover, if possible, the reason for the invasion.

The Maurice River is a deep, navigable stream for several miles from its mouth, but has low and very flat banks for a considerable part of its course, and these are overflowed much of the time, forming under natural conditions a deep morass. Some of the owners along the river combined and organized to dyke out for some miles along the course, and thus several hundred acres of very rich land were made available. The land after being dyked was left water covered for a year or two and then drained. To dry out, it was left another year or two untouched and allowed to grow up into reeds, rushes, grasses and in fact whatever would come in naturally. The result was a dense mass of luxuriant vegetation that afforded excellent feeding ground for numerous insect species, and also for their natural enemies--ground beetles among them.

In the summer of 1908 part of this land was plowed and cultivated and later set out in strawberries. In the spring of 1909 other adjacent land was plowed, and left to be cultivated and prepared for planting later. It was in this mass of plants just turned over that this large lot of *Amara* species matured in late May, and they found themselves entirely without normal insect food, and, at that season, no seeds nor other attractive plant food on the area on which they had been born. But close at hand was the small crop of strawberries on the late set plants of the previous year, and these fell victims to their hunger. Feeding was done chiefly at night, but the beetles could be readily found under the plants during the day, and they ran actively and flew readily.

I advised that the turning under of the drained area be completed as rapidly as possible, and that no new section be plowed under just before a strawberry season, so as to avoid forcing the beetles from their natural feeding grounds just when the berries were most susceptible.

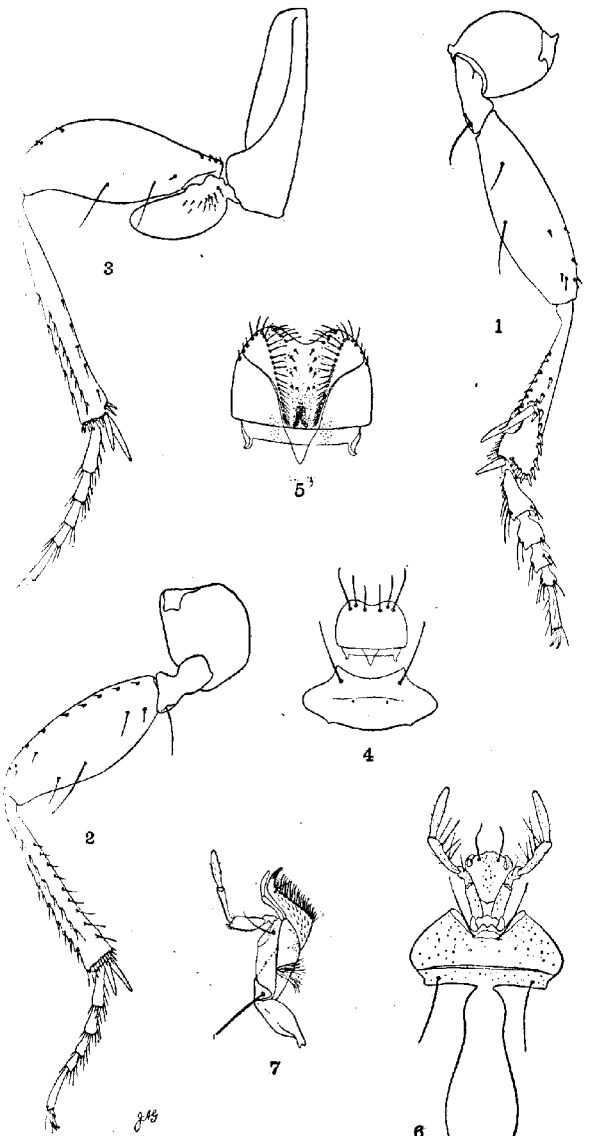


Fig. 4. AMARA AVIDA Say. Structural details: 1, anterior leg; 2, median leg; 3, posterior leg; 4, clypeus and labrum from above, showing setæ; 5, epipharynx; 6, labium from beneath, including gula; 7, maxilla.

BLATTID NOTES

By ARTHUR H. ROSENFELD, *Baton Rouge.*

Eggs of *Periplaneta americana* L.

At various times during 1908, examinations were made of oötheca of the American cockroach, to determine the average number of eggs in these pouches. The results of ten examinations are as follows:

Date of Examination.	Number Eggs in Oötheca.
July 4	10.
August 1	24.
September 4	28.
September 7	18.
September 21	24.
September 21	28.
September 21	28.
September 21	26.
September 21	28.
September 21	26.
Average of 10 oötheca	24.

Eating of Eggs

On August 10, 1908, in a cage containing eleven *P. americana* L., one female was observed carrying a large oötheca. The following morning it was found that the egg-case had been destroyed, nothing but portions of the outer shell remaining. The cockroaches were supplied with an abundance of food, hence the eating of these eggs was not caused by starvation.

Do Roaches Cause Fires?

At the suggestion of Mr. Wilmon Newell, adults of *P. americana* and *Blatella germanica* Linn., were placed in straight-walled glass vessels with parlor matches, in order to determine the possibility, or probability, of these insects setting fire to houses by igniting matches. Fire in houses have several times been thought to have originated through cockroaches or mice igniting matches by gnawing upon them.

No food was supplied the insects in these tests.

Two *Periplaneta,* placed in a Mason fruit-jar June 29, 1908, were dead July 8th. Matches not ignited.

Two *Blatella germanica,* placed in Mason fruit-jar with a few par-

matches July 1, 1908, were still alive August 15th. Matches not ited.

Length of Life

A large specimen of *P. americana* was placed in a breeding cage June 26, 1908, and kept constantly supplied with food in the shape of Irish potato, starch, etc. This cockroach lived until October 30, 1909, or a period of 1 1-3 years.

THE SAN JOSE SCALE AND ITS RELATION TO CLIMATIC DISTRICTS OR LIFE ZONES IN WISCONSIN

By HENRY H. P. SEVERIN, *University of Wisconsin.*

A number of economic entomologists have put the question to me, "Is Wisconsin free from the San José scale?" Marlatt[3] writes, "Wisconsin is, on the authority of Mr. E. P. Sandsten, horticulturist of the state experiment station, now free from the San José scale. The only occurrence of this pest in the state was three years ago in the extreme southern part, and it was here stamped out by the prompt adoption of radical measures." The people of Wisconsin ought to congratulate themselves if such a condition actually exists. From what work my brother and I have done in preparing our paper, "A Preliminary List of the Coccidæ of Wisconsin"[4] (the species mentioned were, with one exception, collected in or near Milwaukee), and from the few days I have spent in the field in or near Madison I am thoroughly convinced that the people of this state would be surprised at the results of a systematic inspection in regard to this pest.

The relation of climate to the spread of the San José scale has been considered by Howard and Marlatt in three bulletins.[1] [2] [3]

Dr. C. Hart Merriam has established a number of climatic districts or life zones within which particular animals or plants perpetuate themselves and outside of which they fail to become established. These life zones are: The tropical, occupying small areas in Florida and southern Texas; the lower and upper austral, covering the bulk of the United States; the transition zone, coming between the last and the boreal zone of Canada northward. "The early records led to the belief that the San José scale would be practically limited to the upper and lower austral zones, and that the important fruit districts in the

[1] Bull. No. 3, U. S. Dept. of Agric. Bureau of Ent., 1896.
[2] Bull. No. 12, U. S. Dept. of Agric. Bureau of Ent., 1898.
[3] Bull. No. 62, U. S. Dept. of Agric. Bureau of Ent., 1906.
[4] Journ. of Econ. Ent. II, No. 4, 1909, pp. 296–298.

northern United States and in the elevated mountain regions, represented by the transition zone, would be slightly, if any, infested. In the main, the records of the distribution of the San José scale have confirmed this belief. Nevertheless, the scale has, in a number of instances, appeared well into the transition zone as fixed by Doctor Merriam, notably in Massachusetts, in New York, in Michigan and a few other points; but in most of these cases the evidence gained from the relation of other animals and plants would indicate that the transition and upper austral zones were not correctly charted, so that in general the belief in the immunity of the transition zone holds."

A comparison of the maps in bulletins 3 and 62, p. 34, shows that the life zones have also been corrected in Wisconsin. According to the former map all that part of Wisconsin south of a line drawn more or less obliquely across the state, from the neighborhood of Milwaukee on the east to near the middle of the state on the west, belongs to the upper austral zone, whereas in the later corrected map only the southwest and southeast corners of the state belong to this zone. The

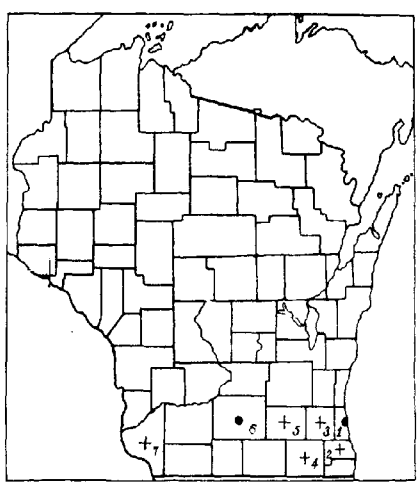


Fig 5, Map Showing Counties in Which the San José Scale Has Been Found; 1 Milwaukee, 2 Racine, 3 Waukesha, 4 Walworth, 5 Jefferson, 6 Dane, 7 Grant.

following map showing the counties in which the San José scale has been found in Wisconsin, indicates that this pest is confined to the southern part of the state. The counties designated by a plus sign are given on the authority of Prof. J. G. Moore, the former nursery

inspector; the heavy, black dots show the localities in which my brother and I have found this pest.

From the present data on the distribution of the San José scale in Wisconsin, it is apparent that it has not been found in the transition zone as limited by the earlier map; however, according to the later corrected map, the pest has established itself within this zone. As Marlatt[3] writes, "too much stress, however, should not be put on zonal limitations, and there may always be outbreaks of longer or shorter standing in the borders of the transition region."

While collecting insects in the vicinity of Madison no attention was at first paid to ascertaining the presence of scale insects, but while working at Tenny Park, which is located about three or four miles northeast of the State Experiment Station, my attention was drawn to a very serious infestation of the Willow scale, *Chionaspis salicis-nigræ* (Walsh).* It occurred most abundantly on two species of dog-wood; the red dog-wood, *Cornus stolonifera*, and the gray dog-wood, *Cornus paniculata*. So serious was the infestation that on many of the red dog-wood shrubs not a bit of red bark was visible, the twigs and branches being plastered from the very tips of the twigs to the roots with this conspicuous white scale. On the red dog-wood these were accompanied by a very serious infestation of the San José scale, causing the shrubs to appear as if covered by soot from the nearby factories and railroads, leaving only here and there small patches of red bark on the branches. In Vilas Park and in a cemetery, both within two miles of the State Experiment Station, the San José scale was again found upon recently planted shrubs.

A twig of this material, which was collected in Tenny Park, was sent to Mr. J. G. Sanders, agent and expert at the Bureau of Entomology, Washington, D. C., in order to have him verify my identification. In a letter he writes: "Your letter of November 7, and accompanying specimen of scale at hand. You were correct in your determination of this scale insect as the genuine San José (*Aspidiotus perniciosus* Comst.). The twig which you sent was very seriously infected, indicating that this particular tree had been infested for at least two or three years."

* Prof. Wm. S. Marshall has pointed out to me, along the University Drive in Madison, this same scale insect, which has become so injuriously abundant on the American Aspen or Quaking Asp (*Populus tremuloides*) as to kill some of the trees.

Scientific Notes

Gypsy Moth at Wallingford, Conn.—A serious infestation of the gypsy moth was discovered at Wallingford, Connecticut, about twelve miles north of New Haven, during December. Up to the time of this writing nearly 6,000 egg-masses had been found and destroyed by soaking them with creosote oil. The center of the infestation is in the village, and while the limits have not yet been determined it is hoped that the pest has not spread to the surrounding country.

The suppression work will be conducted vigorously under the supervision of the State Entomologist, and if possible the pest will be exterminated from this locality, which is the farthest point westward where this insect is known to occur.

Heretofore the only known infested locality in Connecticut was Stonington, where, after four seasons' work, the pest has been nearly exterminated.

W. E. B.

Carbon Tetrachloride vs. Carbon Bi-sulphide.—Several serious disadvantages attend the use of carbon bi-sulphide as a fumigant when used in buildings for the control of pests of grain products or natural history collections, particularly its inflammable character, disgusting and irritating odor, and diagreeable residuum. Last year I experimented with the tetrachloride of carbon, using larvæ of Attagenus as subjects, and found it much more agreeable to use and reasonably effective. On my recommendation several others have tried it with satisfactory results.

In tight cases it should be used at a strength of 45 to 50 cc. per cubic foot. For the standard museum case, 16 x 19 x 3 inches, 15 to 20 cc. is sufficient if the case shuts tightly. For large cases a strength of one quart to 50 cubic feet is desirable—practically twice that of carbon bi-sulphide, of which a pint to 50 cubic feet is sufficient.[1]

Carbon tetrachloride is a clear, volatile, heavy liquid with a specific gravity of about 1.6. It is non-inflammable, and its odor on evaporation is scarcely noticed where that of bi-sulphide would be intensely disagreeable. It is very useful as a solvent of oils, rubber, etc., agreeably replacing gasoline or naphtha for removing grease from clothing or insect specimens without injury to color. ("Carbon," etc.) When purchased at retail the price ranges about 30 or 40 cents per pound, but in quantity it may be had for about one third as much.

ALBERT P. MORSE, *Wellesley, Mass.*

[1] I am aware that this amount of carbon bisulphide is much greater than is generally stated to be necessary, but a strength of one pound to 1,000 cubic feet of space has not proved satisfactory for museum pests, the above proportions being found necessary in the experiments referred to above.

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

FEBRUARY, 1910

The editors will thankfully receive news items and other matter likely to be of interest to subscribers. Papers will be published, so far as possible, in the order of reception. All extended contributions, at least, should be in the hands of the editor the first of the month preceding publication. Reprints may be obtained at cost. Contributors are requested to supply electrotypes for the larger illustrations so far as possible. The receipt of all papers will be acknowledged.—EDS.

The recent Boston meeting must rank, as Boston meetings universally have ranked in the past, as one of the most profitable scientific gatherings. There was a large attendance of entomologists from the northeastern United States in particular. It is to be regretted that so few Washington (D. C.) entomologists were able to be present. Their absence was a distinct loss not only to those in attendance but also in a measure, at least, to themselves. The most satisfactory progress is possible only when investigations and plans for future work are discussed in thoroughly representative assemblies. Aside from all questions of friendship, good fellowship, etc., it is distinctly unfortunate that our progressive Bureau of Entomology was not more adequately represented at the various sessions. The practice of submitting abstracts of the longer papers, leaving the details for publication, appears to be growing and certainly afforded a most welcome relief from the pressure of earlier meetings and thus permitted extremely desirable discussion. Friendly and courteous criticism of results obtained and discussion of methods employed in investigations cannot but result in good to all. There was a large series of very meritorious papers, several of them being concerned with methods, which latter, it should be remembered, eventually determine the reliability of our results. There have been discussions in the past as to the standardization of methods and more attention can well be given to this subject in the future.

The following statement of business manager shows a most gratifying condition of affairs: The year 1909 closed with 542 subscribers, an increase of 57 over the previous year, and with a balance of practically $250. The total income for the year was $1,448.14, with bills receivable of $263.76 and a balance from 1908 of $191.36, making a total income of $1,903.26. The total expenditures were $1,230.93, of

which $1,090.05 was for printing. There are bills payable of $353.10, $268.40 for No. 6 of Vol. II, making the total expense for the year $1,584.03. The publication of the JOURNAL would be very difficult were it not for the generous support of our advertisers. From the tone of letters from our advertisers in renewing their contracts, practically all of which have been renewed, we are led to believe that our readers appreciate the advertisers of the journal and that they are receiving most satisfactory returns from the JOURNAL as a medium of publicity.

The JOURNAL has 140 complete volumes of Vol. I and 500 of Vol. 2. According to the vote of the company in December, 1908, the price of Vol. 1 will be advanced as soon as the stock has been reduced to 100 copies, so that any institutions or libraries wishing complete sets will profit by securing them at once.

Bills for Volume 3 will be mailed to all 1909 subscribers and we shall assume that subscribers wish the JOURNAL continued unless informed to the contrary. If remittances for Vol. 3 or orders for its continuance have not been received by April 1 the subscriber's name will be dropped from the mailing list as required by the orders of the post office department. A prompt remittance will therefore greatly aid the manager and avoid unnecessary inconvenience.

It is our hope to increase our subscription list to over 600 this year, and sample copies will be gladly sent to any interested.

We commend to the thoughtful consideration of our colleagues, a paper in this issue on one phase of parasitism. It illustrates in an admirable manner the complex character of the factors determining the ability of one organism or group of organisms to successfully control injurious species, and emphasizes the necessity of scientific investigation preceding in large measure at least, attempts at practical application. American entomologists now have an opportunity of studying the progress of one of the greatest experiments in the employment of parasitic insects. The scientific portion of this undertaking in New England has already resulted in material additions to our knowledge of parasitic and predaceous forms, while the practical results are most encouraging. Studies of various phases of the natural control of insect pests are being made by entomologists here and there throughout the country and must eventually result in the accumulation of data indispensable to those attempting to make practical use of such agents. With such knowledge as a basis, it may even be possible to discover or develop forms or races with a superior efficiency.

Reviews

The Insect and Other Allied Pests of Orchard, Bush and Hot-house Fruits, by FRED V. THEOBALD. Published by the author, Wye Court, Wye, England, p. I–XVI, 1–550; 326 text figures. 1909.

The author, in bringing together and summarizing the available knowledge respecting British pests, has produced a volume which should be extremely serviceable to American entomologists as well as of great value to English readers. Spraying is considered as of relatively small importance in controlling insect pests, a position quite contrary to American experience, though possibly justified by English conditions. After a brief survey of the characteristics of the various groups of the animal kingdom, summary accounts accompanied by brief bibliographies in many instances, are given of the injurious species. These latter are grouped under their important food plants, those affecting the apple occupying a considerable portion of the volume. The author precedes his discussion by a list of the species treated, the forms being grouped systematically and the character of the injury briefly indicated. American entomologists will be particularly interested in the discussion of the brown-tail moth, the codling moth, the pear midge and other insect pests common to the two countries. It will be noted that the English estimate, so far as injury is concerned, may be very different from the American status. There are many species noticed, some of which are likely to be imported on nursery stock. It might be well if the attempt of Americans to secure uniform common names for injurious insects could be broadened to include, so far as possible, the destructive European pests. The appendix discusses several extra limital species which might become destructive in England, especially the Mediterranean fruit-fly, the cherry fruit-fly, the West Indian scale, the San José scale, and gives the formulæ for various insecticides. The book is printed on a heavy coated paper, and, as a consequence, the numerous illustrations, a number American and many original, come out remarkably well. This volume should be in the hands of every economic entomologist, especially those having charge of nursery inspection work.

Spraying Apples for Curculio and Codling Moth, by E. P. TAYLOR. Mo. St. Fruit Exp't. Sta. Bul. 21, p. 1–69, 1909.

This bulletin summarizes an extensive series of observations and experiments upon these two important pests. The author finds that three early sprays, one when the petals are off, the second ten days later and the third ten days thereafter, resulted in 97.6 per cent of picked apples free from Curculio marks, while 45.5 per cent were damaged on the trees unsprayed. This treatment gave 99.83 per cent of picked apples free from codling moth injury, while unsprayed trees had 14.5 per cent of the picked fruit wormy. Combining the results, three sprays gave 97.4 per cent picked apples free from both kinds of injuries, while unsprayed trees had only 46.1 free from such blemishes. Furthermore, this treatment, by preventing windfalls, gave 45 per cent more picked apples than the unsprayed trees and doubled the cash returns from the crop, giving a net profit, due to the application of the poisons, of $65.36 per acre. Comparisons between applications of Paris green

and arsenate of lead gave a decided superiority for the latter. The author properly emphasizes the necessity of very thorough application if satisfactory results are to be secured. This bulletin is well illustrated and printed on excellent paper.

Insect Enemies of Tobacco, by Z. T. METCALF, N. C. Dep't. Agric. Special Bul. p. 1–72, 1909.

This publication discusses first the general forms of injury, the methods of control and the insecticides available for use. The author concludes from various estimates that there is no danger to the users of the product from applying arsenates to tobacco, though he does not advise such treatment shortly before harvesting. There is a brief discussion of insect structure and classification. Numerous forms are treated in a summary manner, the author making the bulletin of greater practical value by distinguishing between the principal and the lesser insect enemies. The publication is profusely illustrated, the appearance of many figures, however, being seriously marred by the poor quality of the paper.

Fumigation of Apples for the San Jose Scale, by A. L. QUAINTANCE, U. S. Dep't. Agric., Bur. Ent. Bul. 84, p. 1–43, 1909.

This bulletin gives in detail methods employed and results secured in fumigating fruit infested with San José scale. The author has demonstrated the practicability of such treatment and suggests the desirability of its adoption in case the countries now prohibiting the importation of fruit infested by San José scale will accept such fruit. He also calls attention to the applicability of this treatment to other fruits. The bulletin is illustrated by two admirably colored plates, and is made more valuable by an appendix giving a synopsis of the laws and decrees relating to the introduction of live plants and fresh fruits in force in foreign countries, and similar laws and regulations of the various American states.

Bee Keeping in Massachusetts, by BURTON N. GATES, U. S. Dep't. Agric., Bur. Ent. Bul. 75, Part 7, p. 81–109, 1909.

This very readable publication gives a historical sketch of bee keeping in Massachusetts, together with a large amount of interesting local information. There is an annotated list of the more important honey-producing plants, together with local observations on the nectar-producing period in representative regions. Data is given upon the employment of bees in greenhouses. One of the curious results of the investigation is the evidence gathered showing serious injury here and there to the bee keeping industry by the superabundance of gypsy and brown-tail moth caterpillars. This bulletin should be most serviceable to all bee keepers in New England, particularly as it gives a bibliography of the more important articles relating to bee keeping in Massachusetts.

Concentrated Lime-Sulfur: Its Properties, Preparation and Use, by J. P. STEWART, Pa. St. Coll. Agric. Exp't. Sta. Bul. 92, p. 1–20, 1909.

This bulletin gives in condensed form the results of extended experiments in the preparation and application of lime-sulfur washes. The author finds

... a concentrated wash about 27 degrees Beaume (1.23 specific gravity) ... not freeze above 15 degrees Fahrenheit. Results of a series of trials ...etermine the relative amounts of lime and sulfur show that the waste is ...llest when 100 pounds of lime and 195 pounds of sulfur are used to 100 ...ons of water. This, it may be noted, is very nearly the same as the ...dley formula. The field results of several investigators with this wash ...inst San José scale and apple scab are summarized. A table has been pr...pared showing the approximate strengths to be employed for various ...prays. Experiments in the use of poisons with a lime-sulfur wash leads the ...thor to advise the employment of arsenite of lime. This bulletin gives ...luable data upon an important subject.

Current Notes

Conducted by the Associate Editor

Dr. L. O. Howard has approved plans for a special investigation of the ticks concerned in the transmission of the so-called spotted fever of human beings in the Rocky Mountain region. The coöperation of Prof. R. A. Cooley, who has done notable work on the ticks of Montana, has been obtained. He will become a collaborator of the bureau on March 1, and supervise the work done in Montana. An agent of the bureau will be stationed in the Bitter Root Valley, where a particularly virulent strain of the disease occurs, for studies of the tick throughout the season. The biological survey of the department of agriculture has agreed to place a man in the valley to obtain data on the exact limitations in the distribution of the various animals that serve as hosts for the ticks. This investigation is connected with the other tick work of the Bureau of Entomology, under the direction of Mr. W. D. Hunter.

Plans have been perfected for a coöperative investigation by the Bureau of Entomology and Clemson College of South Carolina of the cotton red spider (*Tetranychus gloveri*) in that state. A joint agent will be placed in the field on February 1.

Mr. D. L. Van Dine, engaged in investigations of the sugar cane and rice insects in the Bureau of Entomology, is about to locate at Audubon Park, New Orleans. Plans have been perfected for coöperation with the Sugar Experiment Station of the state of Louisiana. Mr. Van Dine will locate in quarters furnished by the station. His laboratory will be opened about February 1. Mr. T. C. Barber, who is engaged in the study of the relation between the Argentine ant and the sugar cane Pseudococcus, under the direction of Mr. Wilmon Newell, will be located with Mr. Van Dine.

Since the Division of Insects has been moved into the new National Museum building, the additional space has given enough room so that the entire systematic collections amassed by the Forest Insect Investigations have been moved into that building.

J. F. Zimmer, who has been working on citrus fruit insects in the Bureau of Entomology, has been transferred to the branch of deciduous fruit insect investigations.

Reginald Wooldridge has been appointed as an agent and expert for work

in the Gypsy Moth Parasite Laboratory of the Bureau of Entomology at Melrose Highlands, Mass.

Mr. M. M. High, working in the branch of truck-crop and stored-product insect investigations at Starkville, Miss., has been ordered to Brownsville, Texas, to continue the same line of work in that vicinity.

Mr. H. M. Russell, who works in the same branch formerly located in southern Florida, with headquarters at Orlando and Miami, is now located at Compton, Cal., in the special study of insects injurious to sugar beets and other vegetable crops.

Mr. W. B. Parker, University of California, Berkeley, Cal., was recently appointed collaborator in the same branch.

Mr. R. E. Snodgrass completed his work in the Bureau of Entomology on the anatomy of the honey bee in September, and left for a short trip through England and Scotland. He has now returned and is engaged in the work on the prevention of the spread of moths.

Dr. G. F. White, expert in bacteriology of bee diseases in the Bureau of Entomology, is spending the winter in Germany, taking courses in pathology in the University of Freiburg.

Mr. A. H. McCray, of the Bureau of Entomology, is on furlough for the college year. He is attending Ohio State University.

Prof. Herbert Osborn, of Ohio State University, who was granted a year's leave of absence from his university last June, is engaged in investigating the economic importance of the Jassidæ, with reference to the production of cereal and forage crops. Professor Osborn has been carrying on his investigations in the field throughout the northern part of the country during the past summer and will continue his work in the South and Southwest during the coming spring and summer, embodying the results in a comprehensive report to be published later by the Bureau of Entomology.

W. C. O'Kane, A. M., a graduate of Ohio State University, has been appointed instructor in entomology at the New Hampshire College of Agriculture and the Mechanic Arts at Durham, N. H.

The Cambridge Entomological Club gave a smoker in Copley Hall Tuesday evening, December 29, to which were invited all entomologists and geologists attending the scientific meetings.

Dr. E. P. Felt, state entomologist of New York and editor of this JOURNAL, visited several European museums during November and December for the purpose of studying special collections.

Prof. John B. Smith gave the annual address before the Entomological Society of America at the Boston meeting Thursday evening, December 30. His subject was "Insects and Entomologists; Their Relation to the Country at Large." The address was illustrated with lantern slides, and was open to the public.

Mr. Theodore D. Urbahns, formerly of the Bureau of Entomology, U. S. Department of Agriculture, has been appointed assistant in research field

k in the Department of Entomology of the Minnesota Agricultural Experiment Station.

Mr. Arthur H. Rosenfeld, formerly assistant entomologist on the staff of the State Crop Pest Commission of Louisiana at Baton Rouge, has been appointed entomologist of the Estacion Experimental Industrial Agricola de Tucuman, Argentina, and has entered upon his new duties.

Prof. F. L. Washburn of the University of Minnesota and of the Minnesota Agricultural Experiment Station, has been granted a two months' leave of absence by the board of regents, and will spend February and March studying conditions governing the control of insects affecting market gardens and small land holdings in Europe.

According to the Experiment Station Record, Prof. John F. Nicholson, formerly entomologist and botanist of the Oklahoma College and station, has been appointed bacteriologist at the Idaho College and station and has entered upon his duties.

At the Oregon College and Experiment Station Mrs. Laura Hill Griffin has resigned as assistant entomologist and Miss Alice L. Edwards has been appointed in her place. Miss Edwards is a graduate of the college in the class of 1906.

A department of economic entomology has been organized at the University of Wisconsin, and Mr. J. G. Sanders, formerly of the Bureau of Entomology at Washington, has been placed in charge, with the rank of assistant professor. Mr. Sanders will also be state entomologist, and will have charge of nursery inspection. He will assume the duties of his new position about February 1.

In August, 1909, the Connecticut Legislature just before adjournment passed a law providing for the inspection of apiaries of the state and placing the work under the direction of the state entomologist. The appropriation is small, being only $500 for the biennial period. Two experienced beekeepers have been appointed as inspectors, Mr. H. W. Coley of Westport for the southern portion of the state, including Fairfield, New Haven, Middlesex and New London counties, and Mr. A. W. Yates of Hartford for the northern portion, Litchfield, Hartford, Tolland and Windham counties.

Mr. H. L. Frost of Arlington, Mass., has been appointed a trustee of the Massachusetts Agricultural College at Amherst. The appointment was made by Governor Draper and the term of office is for seven years, beginning January 5, 1910. Mr. Frost is a graduate of the college, is a member of the American Association of Economic Entomologists, and is the head of the well-known business firm of H. L. Frost and Company, foresters and entomologists.

Prof. Wilmon Newell, secretary and entomologist of the Louisiana State Crop Pest Commission and entomologist of the Agricultural Experiment Station at Baton Rouge, has resigned to accept the position of state entomologist and entomologist of the experiment station of Texas. He will devote his entire time to investigation and research work along economic lines,

since he is not connected with the college. His address, after January 3., 1910, will be College Station, Texas.

On Friday, December 31, 1909, a tablet was unveiled at Milton, Mass., on the house where Dr. T. W. Harris formerly lived. The tablet is of white marble, to harmonize with another tablet on the same house, which commemorates the meeting at which the Suffolk Resolves were adopted prior to the Revolution. It bears the following inscription, written by Col. T. W. Higginson, who was a pupil of Doctor Harris:

IN THIS HOUSE FROM 1824 TO 1831 DWELT
THADDEUS WILLIAM HARRIS M. D.
BOTANIST, ENTOMOLOGIST; AND FINALLY
LIBRARIAN OF HARVARD COLLEGE

IN EACH CAPACITY HE WON
FOR HIMSELF FAME AND GRATITUDE

HE HAD THE MODESTY AND UNSELFISHNESS
OF TRUE SCIENCE
WITH WHAT MAY RIGHTLY BE CALLED
ITS CHIVALRY OF SPIRIT

At the unveiling the American Association of Economic Entomologists, the Entomological Society of America and the American Entomological Society were represented by William M. Wheeler, professor of economic entomology in Harvard University; the Boston Society of Natural History, by its curator, Mr. Charles W. Johnson; the Cambridge Entomological Club, by Mr. H. H. Newcomb; the Milton Historical Society, by Dr. W. W. Newcomb of Detroit, Mich., and Mr. W. L. W. Field of Milton, Mass.; the Science Club of Milton Academy, of which Doctor Harris was a trustee, was also represented.

According to the Experiment Station Record, "the *London Times* announces the appointment by Lord Crewe of a scientific committee of twenty, to be known as the African Entomological Research Committee, the object of which will be to further the study of economic entomology, with special reference to Africa. Lord Cromer has consented to act as chairman and Guy A. K. Marshall as scientific secretary.

"Arrangements are being made to send trained entomologists to the east and west sides of tropical Africa, respectively, to stimulate interest in entomological work among the officers and other residents of the regions, and to afford instruction in the use of scientific methods. It is hoped thereby to obtain an organized body of investigators. The committee will also keep in touch with work already under way, and has received offers of coöperation from the British Museum, the London and Liverpool Schools of Tropical Medicine, and the leading English universities. It is planned to publish observations and scientific results in a journal or series of bulletins to be established."

Mailed February 15, 1910.